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CHEMICAL & Metallurgical ENGINEERING

for FEBRUARY, 1945

AMERICAN CHEMICAL ENGINEERING LOOKS ABROAD

A symposium featuring the 22nd Chem. & Met. annual review number

Our chemicals, equipment, and know-how must soon find foreign markets

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CHEMICAL & Metallurgical ENGINEERING

FEBRUARY • 1945

Volume 52 Number 2

In this Issue

CHEMICAL ENGINEERING LOOKS AT THE WORLD

Chem. & Met.'s 22nd Annual Review & Forecast Number

Regular Monthly Features

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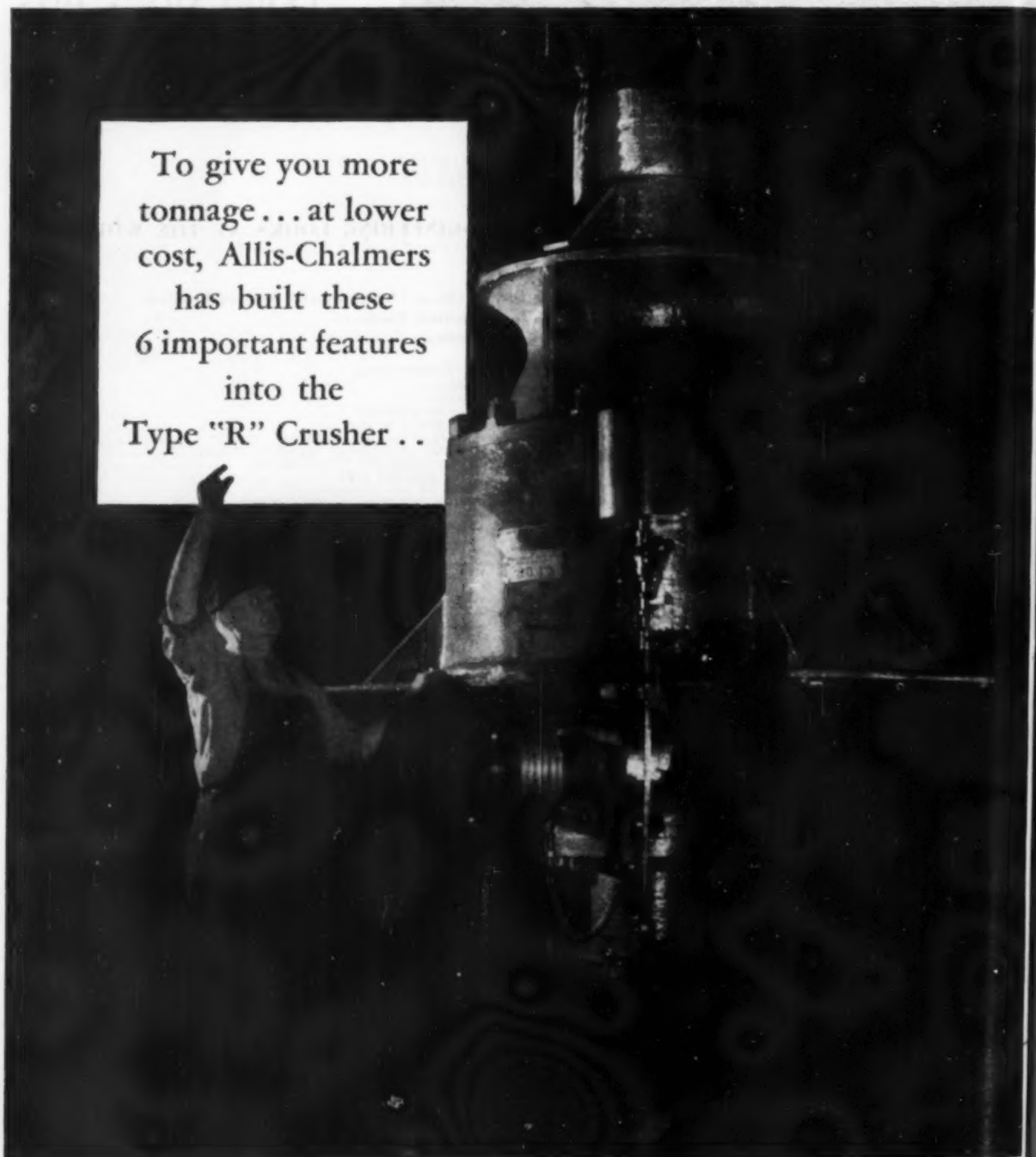
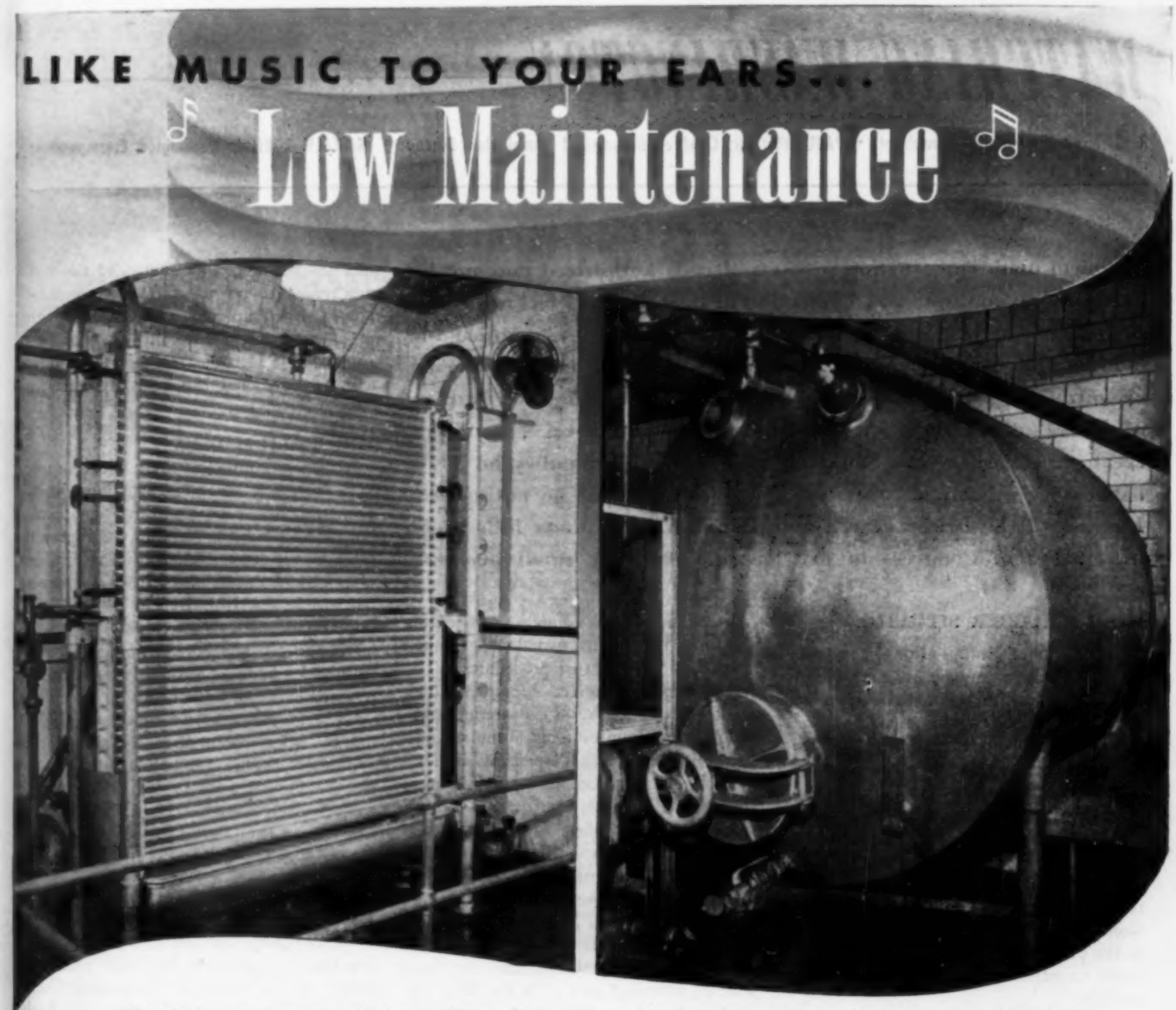
Here's the 1945 Picture





This aluminum regenerative cooler has seen 12 years' continuous service. Maintenance costs have been low.

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ALCOA FIRST IN **ALUMINUM**

WATCHING WASHINGTON

R. S. McBRIDE, Editorial Consultant • PAUL WOOTON, Chief of McGraw-Hill Washington Bureau • MALCOLM BURTON, Washington Correspondent

Chemical plant construction projects already authorized may not be permitted to continue . . . Protection against draft of technical personnel for the chemical industry . . . Heavy penalties applied for holding tank cars overtime . . . CIO invites scientific and engineering organizations . . . Synthetic liquid fuels investigations of Bureau of Mines go ahead . . . Who should set commercial standards creates controversy . . . Should a national fertilizer policy be established? . . . No new construction for sodium will be authorized. Platers will be hit by scarcity of cadmium. . . . Many bills to be introduced in Congress to provide financing for small business.

WORLD RUBBER SITUATION

The Rubber Study Group composed of representatives of the governments of the Netherlands, the United Kingdom and the United States reports that a marked disequilibrium between the productive capacity of the world and the demands for consumption could develop in the course of a few years after the liberation of the Far East. Over a longer period, however, the group is hopeful that the very marked upward trend in world consumption of rubber will continue and that an expanding world economy will lead to greater increases in the per capita consumption of rubber in many countries where the present figures are low.

HOLD-UP ON NEW PLANTS?

The WPB's program for expansion of chemical manufacturing facilities may be embarrassed and perhaps seriously curtailed if Justice Byrnes' office were to apply literally its threatened ban on all new plant construction in critical labor areas. Most chemical operations are closely allied with large munitions works and therefore located in regions where the manpower situation has become increasingly tight. While some relaxation from the rigid terms of the Byrnes policy are confidently expected, there had been no actual showdown on essential chemical plant construction at the time this magazine went to press.

When WPB Chairman Krug announced his five-point program to increase war production, he stated quite tersely "restrictions on constructions will be strengthened." This was later explained by saying, "Full details on the method to be used in further restricting construction have not as yet been worked out. However, the Army, Navy, WMC and WPB have agreed to take such action."

Speculation in Washington concerning the form restrictions would take leaned toward a choice of two procedures. The first would be a blanket stop-order which would be followed by (1) a careful examination of all outstanding authorizations, (2) permission for 100-percent essential war jobs to go ahead, (3) prohibition of non-essential projects, and (4) a general tightening of all future authorizations.

The second method would be to permit all authorized construction to proceed, but this would be followed by stop-orders on specific non-essential jobs and a tightening of future authorizations.

Pending the establishment of such policies, informed sources in the War Production Board say that there is no assurance that chemical plant construction projects already authorized will be permitted to continue. This would include such apparently essential facilities as sulphuric acid, rubber chemicals and some forms of ammunition.

A NEW MANPOWER PINCH

There has been one important change in manpower policy which is significant for process industries. It is the greater attention to the need for retaining professional and technical workers. The Instructions from Justice Byrnes to Selective Service, released the middle of January, gave for the first time a clear and workable definition of the needed technical personnel which are often required as key men for industries that are rated as less than critical or essential.

Particularly new were the instructions for Selective Service deferment of research workers, even those not in the more essential industries. This decision apparently came from a recognition of the social importance in the early postwar period of having new research results available for all divisions of business. The actual results will be limited, of course, to the way in which local boards apply these general orders. But employers now have a much better chance to hold really essential personnel of a technical sort. They are actually urged and expected to do so in the public interest.

NEW HELIUM USES

At the beginning of the war the supply of helium was so little that the government rushed to completion five new plants capable of producing 25 times the prewar volume of helium from natural gas. The supply so produced now exceeds the military needs; and the Bureau of Mines is shipping regularly large volumes for commercial uses. The bureau would welcome further demands as apparently government requirements are not likely to reach at all close to the capacity for production. Inquiries from potential users should be addressed Bureau of Mines, Washington 25, D. C.

Immediate availability of helium for private and commercial users renews interest in possible industrial applications of this gas.

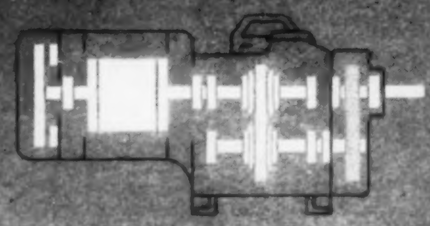
DEMURRAGE HIGHER

In two steps the rate charged for holding tank cars overtime has been raised by orders of the Interstate Commerce Commission. On January 22 the very high rate of $11 per car per day after only 24 hr. free time was imposed. After the first five days the penalty is $22 per car per day. This makes retention of cars so expensive as practically to prohibit delays in either loading or unloading of this scarce equipment. That is definitely the intention.

CONVENTION PENALTIES SET

Justice Byrnes means business when he announced that conventions, trade shows, and various group meetings must stop unless very essential. There was prompt voluntary cancellation of large numbers of meetings as a result. But officials took no chances on whether all those in charge of these meetings would cooperate. They have provided plenty of penalties. Hotels and other institutions which cooperate in the holding of unauthorized gatherings will very definitely be penalized. One easy means proposed at least informally is the cutting off of OPA ration allowances.

Any organization feeling that it must hold a gathering because it is in the interest of national defense or public welfare may apply for an approval to a special "War



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MASTER SPEEDRANGERS

Committee on Conventions" which functions under the Office of Defense Transportation. The committee states that the yardstick it will use to measure the necessity for a gathering is "how the winning of the two wars we are now fighting will be impeded if the meeting in question were held to an attendance of 50 or cancelled outright."

WHITE-COLLAR UNION?

Scientific and engineering organizations were asked to join with other groups by an invitation from CIO to consider "the economic and war problems of the millions of white-collar and professional employees." Several chemical and engineering organizations were invited which did not attend.

The gathering was held in Washington on January 15 with 40 or 50 group representatives participating. The general decision was to discuss through a committee the ways and means of further action along these lines. The CIO says that it does not seek to control the form of organization nor insist on affiliation with CIO. But evidence of a desire for that result is clear, and logical.

Critics of the program emphasize that a purely professional group can hardly work effectively in the same single organization with dry goods store clerks, office workers, and other sub-professional or general white-collar groups. However some professional engineering representatives and those from medical and legal groups have not yet withdrawn from the program. In fact a few of them have a plan for continued participation.

PILOT PLANT STARTED

A contract was let in mid-January for the initial construction at Bruceton, Pa., of the chemical engineering development facilities to be used for the synthetic liquid fuels investigations of the U. S. Bureau of Mines. Actual construction of the buildings was not authorized in the first contract but it was expected that such authorization, perhaps actual erection, will start during February under a secret contract.

The bureau hopes to occupy the new laboratories with their large laboratory-scale hydrogenation and gas-synthesis equipment before the end of this calendar year. These investigations will soon lead to plans, it is hoped for "the demonstration pilot plants" which the bureau is to build later at the cost of some millions of dollars each. The present development laboratories are expected to cost over $1,000,000.

GOODS SUBSIDIES

Two kinds of subsidies have been paid by Reconstruction Finance Corp. to increase or maintain supplies of commodities needed for the war effort. One of these types has been merely monetary aid in order to permit industrial operation despite price ceilings. A total of a billion and a half dollars has been so paid to help in the production or transport of certain goods, including: Sugar, rolled aluminum, refractory brick, nitrate of soda, sodium bichromate, petroleum products and a number of scarce metals including ferrochrome.

A large number of other commodities have been bought, through Defense Supplies Corp. or Metal Reserve Co., and resold at a loss. The total funds so utilized have been very great with an aggregate loss of about $143,000,000. Among the commodities of interest to process industries are the following: Calcined petroleum coke, molasses, nitrate of soda, sugar, alumina, aluminum (primary), antimony ore, arsenic, chrome ore, copper, copper ore, magnesium, mica, nickel, pig iron, platinum, tin, tungsten ore, vanadium ore and vanadium, and several varieties of metal scrap.

PETROLEUM AIDED BY RFC

Major financing of numerous war projects by Defense Plant Corp. is widely known, but few realize the tremendous magnitude of this spending in certain industries where loans and advances of RFC have supplemented actual government-paid construction. For example high-octane gasoline projects have required $190,000,000 in addition to government construction. Oil and gas pipe lines have been largely government owned; but the corporation has expended $440,000,000 in addition for the purchase of crude petroleum and petroleum products which have been resold. These sales have been at a profit so that the government has made $67,000,000 on the transactions. In addition subsidy payments have assisted in stimulating crude oil production from stripper wells, thus contributing substantially to national production at relatively nominal subsidy cost.

STANDARDS CONTROVERSY

Setting of commercial standards by National Bureau of Standards, or by some commercial agency, has been the subject of much discussion and some heated controversy recently in Washington. A number of groups are anxious that this commercial standardization work shall be taken over by American Standards Association. These persons believe that the government work is apt to ignore certain practical industrial considerations. They, therefore, are urging the ASA be speeded up to cover both industrial goods and consumers' goods specifications or standards.

Hidden in this controversy is the difference of opinion regarding the use of standards rather than advertised brands as a guide to householder purchasers. Those working for more government activity often go so far as to say that standards should be imposed by consumer agencies rather than follow the conservative policy of the Bureau of Standards. The latter is intended to make the government only a leader and coordinator of industrial standards groups. That is not nearly drastic enough to suit the "do gooders."

MAKING FERTILIZER POLICY

Several Washington agencies admit that they should establish "a national fertilizer policy" to guide the country through the postwar period. The first completed report of this sort has been issued with no undue expectation of adoption by National Planning Association. It is a middle-of-the-road document prepared by competent persons not directly connected with the industry. Still in the making at the end of January was the program of the Department of Agriculture, which has a formal committee charged with this duty.

The ardent "planners" have been hoping that the policy finally adopted would be that to be made by Tennessee Valley Authority under the bill offered by Sen. Lister Hill of Alabama. That legislation got no serious consideration in the last Congress. It's fate this year will probably be determined by the extent to which the President personally chooses to back it. If he makes an issue of the question there may be not only this legislation, but also the possible establishment of a Missouri Valley Authority.

The National Fertilizer Association has not formulated its own program formally. This is perhaps due to the fact that it is just now undergoing fundamental changes in top management, forced by the retirement of Charles J. Brand.

CARTEL PUBLICITY

Continuing the effort for control of cartels, Senator O'Mahoney has reintroduced his bill requiring publicity on international contracts. This is S. 11 of the new Congress and has the title "To protect the foreign relations and to promote the trade and commerce of the United States, to require the disclosure to the United States of information affecting such trade and commerce and to safeguard the security of the United States."

The basic idea of this legislation is to prevent many international dealings by the threat of publicity. Also intended is the requirement for filing of all such agreements so that policing by the government will be simplified. Active support of the measure by the administration is expected.

METAL SCHEDULES SET

WPB announced schedules for metal production for 1945. The aluminum program is substantially higher than expected a few months ago, a natural result of European military activities. The production of primary aluminum last year was 1.5 billion pounds which compared with 1.8 billion pounds in 1943 and 1.0 billion

pounds in 1942. The schedule for 1945 is in excess of one billion pounds.

Magnesium activities remain unchanged by the changed military program. This year's schedule requires only 90 million pounds production as compared with 340 million pounds last year and 370 million pounds in 1943. There are 15 plants available to produce primary magnesium but only six will operate. Three of these are privately owned at Midland, Mich., Freeport, Tex., and Permanente, Calif. The other three will operate at about half capacity.

Steel, copper, lead, zinc, and tin facilities will be pushed to the limit in each case. This limit will often be fixed by manpower, not by plant facilities or by raw material. Scarcity of lead for pigments and chemical equipment illustrates the consequence of this manpower shortage as it pinches on process industry.

HIGH OCTANE vs RUBBER

Every alcohol plant with raw material will be pushed to the limit during 1945 to permit maximum butadiene manufacture from alcohol. This is necessary in order that butylene may be used to the maximum extent for high-octane aviation gasoline.

The rubber program will not suffer from this shift; but the alcohol users will. The total estimated production for the year is 603 million gallons in contrast with a requirement of 655 million. The deficiency will be made up out of the government stock pile. The only practical means for increasing production capacity is stated by WPB as being the use of invert molasses. But use of raw sugar for that molasses is not feasible because of the sweetener shortage in Cuba and the United States.

NO NEW SODIUM PLANTS

Sodium which is under strict allocation is expected to remain on the scarce side for some time. It is probable that no new construction will be authorized. It would take a year to complete a plant which would be too late to help the present situation and would take a quantity of labor and materials that can be used to better advantage elsewhere. Not the least of the difficulties would be the location of sufficient electric power available in one place. The alternative is more careful screening of all uses and brutal elimination of those considered to be non-essential.

CORN FOR WET GRINDERS

WPB officials do not expect ethyl alcohol to be affected by establishment of the 50,000,000-bu. corn stockpile by War Food Administration. Instead, the set aside will benefit the wet grinders. It is known that in past years WFA was urged by WPB to establish a stockpile but because of the corn-hog ratio, the lack of sufficient corn to feed the excess hog population, and for political considerations WFA found it inexpedient to do so.

This year there is plenty of corn with which to start the stockpile as well as to permit distillers to swing over to corn from sugar for the production of ethyl alcohol for industrial purposes. Although the corn is available its use for beverage making is something else in the eyes of WFA administrator who has decreed that the distillers may use corn to only 50 percent of their requirements. However, the distillers are not disturbed because sorghums are available in quantity and they are in no danger of having to go back to wheat.

TARIFF REPORT EXPECTED

A senate resolution of December required a report of U. S. Tariff Commission on the import conditions expected after the war. Specifically asked was the probable effect of permitting Presidential adjustment of tariff rates up or down by 50 percent from the legislative base.

The commission will report on each item for which 1939 imports were valued at over $100,000 and others if it wishes. Estimates of economic consequences are to be made both on the assumption of a national income equal to 1939 and assuming a national income of 75 percent greater than that. The report is expected by the end of February, which gives plenty of time for Senate consideration of its findings and recommendations before Congress must decide on extending the Reciprocal Trade Agreements Act which will expire June 12 unless extended.

STATE DEPT. SET-UP

The new organization of the Department of State is very completely described in the bulletin issued by that department the middle of December. The way the department is working out is already making clear that intimate commodity studies will be taken into account in the political and diplomatic proceedings. However, Washington spokesmen of industry admit that they still have a big job to do in educating the career staffs who heretofore have not based any significant part of their judgment on these commercial and commodity considerations.

One specific evidence that the department is serious in its change of emphasis is the placing of commodity attaches at certain embassies. Initially these men have been those chosen to investigate and report on mineral questions. It remains to be seen how much further this commodity program will be developed by means of foreign representatives.

ALLOCATIONS REACH NEW HIGH

For the first time value of chemicals allocated has exceeded the rate of $200,000,000 per month. The dollar volume is an excellent measure of the magnitude of the work being carried on by the Chemicals Bureau of the War Production Board.

HELP WANTED

Recently announced increases in urgent military programs mean very large increases in chemical requirements. Explosives, rockets, aviation gasoline, rubber, and rayon tire cord reach far into chemical production, research and development. There are many other military increases whose dependence on the chemical industry is equally vital.

Current shortages are requiring search for alternate materials; lack of capacity necessitates new or modified processes or construction of new facilities; combat zone conditions raise problems calling for research. There is need for technical volunteers and for additional facilities to help this urgent work and to supplement the efforts of those already devoting all their energy to the single purpose of shortening the war.

Anyone in the chemical industry not tied up with war contracts should get in touch with one of the government research agencies. The services of individuals or organizations and their facilities can be put to work on vital research projects.

MORE TUBES FROM BUTYL

An increasing supply of butyl rubber has made it possible to expand its use for inner tubes used on light trucks. This is the second move of the kind made since last November, when butyl rubber was limited to tubes in the large truck and bus size. The new regulation applies to tubes down to and including 6.00 cross section.

CADMIUM NOW SHORT

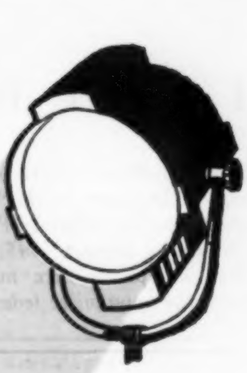
Platers will be hit by the scarcity of cadmium which in recent months has reached the acute stage. Under the cadmium conservation order, M-65, about 80 percent of the available metal is allocated to the plating industry. Other uses have been cut to the irreduceable minimum and no substitute material is available. As the shortage of metal becomes more serious the only cut that can be made is in the one big use.

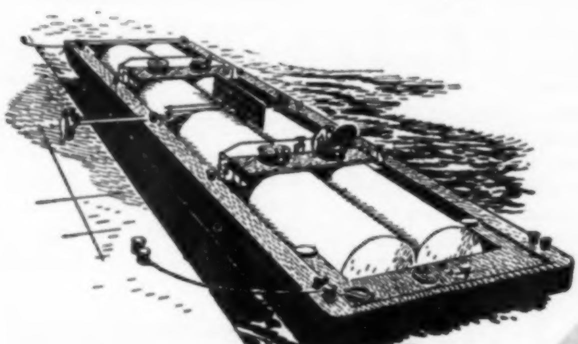
Cause of the present shortage is the declining rate of operation among the zinc smelters. This is a manpower problem entirely, since the smelter capacity is available and there are ample supplies of zinc concentrates, particularly Tri-States concentrates that run high in cadmium. Although the industry is very pessimistic in regard to 1945 production, there are indications that the necessary labor will be made available.

MORE FEDERAL FINANCING?

At least 30 bills are to be introduced in the new Congress to provide for federal financing of industrial concerns employing less than 500 people, i.e., small business as per official definition. These bills go to both extremes. Some would have direct loans made by government agencies while others would have loans made only through private banking facilities.

Columbia Spotlight

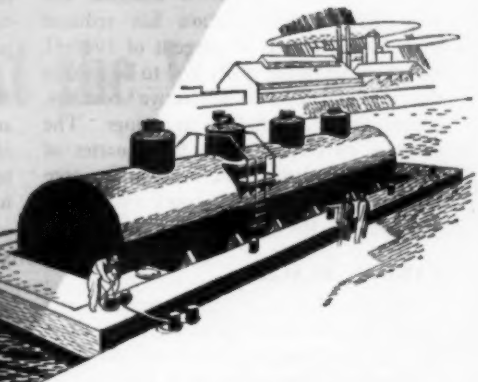




First Chlorine Barge

Newest development in the transportation of Liquid Chlorine is this barge, especially designed by Columbia to facilitate shipments via inland waterways. All river shipments of this chemical were previously limited to one-ton containers—a slow, tedious and costly method by comparison.

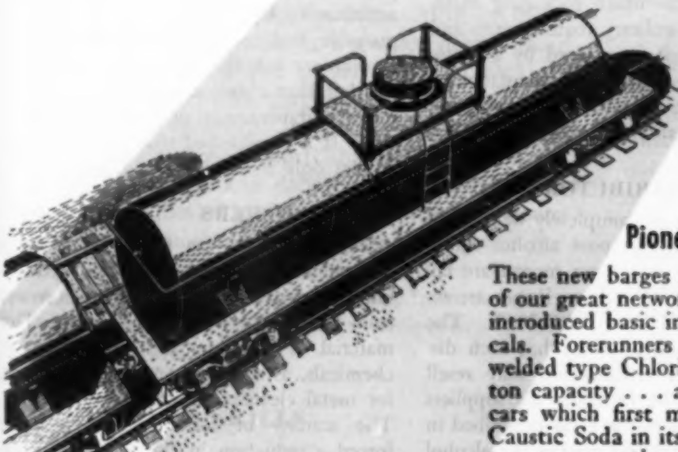
Cradling four fusion welded steel tanks in its 135-foot steel hull, the new barge has a capacity of 380 tons of Liquid Chlorine. It may be loaded or unloaded from either side; connections are so designed as to prevent manifolding of the tanks.



First Caustic Soda Barge

Another 135-foot barge has just been placed in service by Columbia. This one, the first designed specifically for Caustic Soda, will carry approximately 500 tons of Caustic Liquor. Its huge, welded tank is supported by suitable framework in a heavy steel hull.

Foamglas insulation guards the Caustic from freezing and a caustic resistant lining prevents metallic contamination of the chemical in transit.



Pioneer in Better Transportation

These new barges show the way to the more advantageous use of our great network of inland waterways. Similarly, Columbia introduced basic improvements in rail transportation of chemicals. Forerunners of these barges were Columbia's fusion welded type Chlorine tank cars . . . then Chlorine cars of 55 ton capacity . . . and the insulated and specially lined welded cars which first made possible the shipment of 73% Liquid Caustic Soda in its purest form. In every case, Columbia customers were the first to profit by these innovations.

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COLUMBIA ESSENTIAL INDUSTRIAL CHEMICALS

Soda Ash · Caustic Soda · Sodium Bicarbonate · Liquid Chlorine · Silene EF (Hydrated Calcium Silicate) · Calcium Chloride · Soda Briquettes
Modified Sodas · Caustic Ash · Phosflake · Calcene T (Precipitated Calcium Carbonate) · Calcium Hypochlorite

INTERPRETATIONS

This installment covers orders, rules and regulations issued by the War Production Board and the Office of Price Administration during January, 1945. Copies of each item interpreted here may be obtained from the appropriate federal agency.

LINSEED OIL

Because of increased military requirements for oil and the uncertainty of receiving sufficient imported flaxseed, the War Food Administration has reduced from 60 percent to 50 percent of 1940-41 use, the quantity of linseed oil to be used in the manufacture of protective coatings, coated fabrics, and floor coverings. The order is effective for the first quarter of 1945 but probably will have to be continued until current conditions have changed for the better.

CARBON BLACK

Closer control is being exercised over allocation and use of carbon black because of larger requirements for heavy duty tire production. Beginning with February allocations, the terms of Order M-300, Schedule 32, must be complied with strictly. The end use breakdown must be given for the various carbon blacks for which requests are made. Specifically, the war and civilian code numbers designated opposite the end use classifications of the order must be given showing the quantities of carbon black required for each such code number designation.

POTASSIUM CARBONATE

Existing military needs for potassium carbonate have increased and new direct military requirements have developed. In order to safeguard the supply, WPB has adopted the suggestion of the industry advisory committee and placed the chemical under allocation control. Distribution now is in accordance with Schedule 85 of Order M-300. Consumers are required to file Form WPB-2945 by the 15th of the month preceding the month in which delivery is requested while suppliers are required to file Form WPB-2946 by the 20th of the preceding month. In addition to military requirements for the production of explosives, potassium carbonate is used in glass, rubber, pharmaceuticals, textiles, dyes, chocolate, metals, and chemicals.

UNDER ORDER M-300

Ipecac and emetine have been placed under the controls of Order M-300 and at the same time Order M-350 has been revoked. No substantive changes are involved in the transfer.

Sodium phosphate and alkanolamines have been removed from control of Order M-334 and M-275 respectively and placed under M-300. According to provisions of Schedule 82 customers may obtain a maximum of 80,000 lb. of trisodium phosphate bi-monthly by submitting an end use certification. Six sodium phosphate chemicals have been removed from allocation control. They include anhydrous tri sodium, crystal di sodium, and crystal tetra sodium. Sodium hexa meta sodium, sodium tri poly have been eliminated from the order because end uses can be controlled by allocation of the raw materials used in their production.

Bismuth chemicals are now under M-300. Purchasers of more than 25 lb. in any month are required to send certificates of use to their suppliers. Suppliers are required to file Form WPB-2947 showing monthly delivery schedules.

METAL FOR CANS

Restrictions on the use of metal for cans and closures for glass containers have been changed to permit use of steel instead of substitute materials, many of which are now more critical than steel. Packers may use un-tinned steel without quota restrictions since supplies of sheet steel are more adequate than those of paper and several other packaging materials. Cans for military requirements and for the food pack are assured by a clause in M-81 which states that manufacturers must supply these needs before producing other types of cans.

ALCOHOL DISTRIBUTORS

Distributors of completely denatured, proprietary solvent or pure alcohol whose requirements for resale per month are between 54 and 3,500 gal. no longer are required to file Form WPB-2947. The amended schedule provides that each distributor in that classification may resell such alcohol if he furnishes his suppliers with a certificate in the form prescribed in Appendix D of M-300, stating the alcohol is to be resold and specifying the quantity for each group of end uses listed in the schedule. Each distributor ordering between 3,500 and 3,888 gal. a month must continue to file Form WPB-2945 but need not file Form WPB-2947.

COLLAPSIBLE TUBES

An amendment to the collapsible tube order issued January 15, limits the use of lead in tubes during the first quarter to 15 percent of the amount used in the first six months of 1944. There is no control over the end use of collapsible tubes except that end users are limited in the amount of tin that can be used in packaging various products. However, tube manufacturers must deliver for medicinal purposes at least a quantity equal to the amount delivered in the first quarter of 1944.

PHTHALIC ANHYDRIDE

Except for the 10-pound small-order exemption, no phthalic anhydride can be sold without WPB authorization. This control was established by an amendment to the existing order which specifies that all stocks of phthalic anhydride are subject to Schedule 67 of M-300 notwithstanding the consumers' stock exemption of Order M-300. This action was deemed necessary because of the critical supply situation.

PEROXYGEN CHEMICALS

Military requirements have become so heavy that the monthly small-order exemption has been reduced from 600 lb. to 120 lb. a month. This followed an amendment to Schedule 5 of M-300. In addition to military needs, peroxygen chemicals are used for textile bleaching and dyeing, metallurgical and chemical operations, and for food processing.

MARKET WOOD PULP

The Forests Products Bureau of WPB has notified every paper and paperboard mill to curtail its use of market wood pulp during the first quarter of 1945 by five percent below the consumption originally authorized. While the shortage made it probable that most mills would suffer an involuntary cut of at least this amount, it was felt that a uniform reduction was the most equitable means of meeting the situation. It is emphasized that the restriction applies only to market wood pulp.

GLYCOL ETHERS

Glycol ethers are feeling the effects of a cut in small order exemptions. Monobutyl ether of ethylene glycol has been cut from 4,000 lb. to 400 lb. per month. This material is used in the production of chemicals, as a solvent in hydraulic fluids, for metal cleaners and metal cutting oils. The scarcity of formaldehyde also has forced a reduction in the small order exemptions for urea and melamine resins from 2,000 lb. to 550 lb. a month.

PRICE REGULATIONS

An increase of three percent in ceilings for fire clay and silica refractory brick is granted to producers east of the Mississippi and in Missouri.

Synthetic resins, plastic materials, and substitute rubber not marketed during March 1942 when offered for sale are subject to price review and revision by OPA.

Increased labor costs, bagging and transportation in South America have brought an increase of 75 cents a 100 lb. in importers' maximum prices for solid quebracho extract.

CHEMICAL
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Chemical Engineering Looks at the World

ONE who has recently returned from the battle fields of Europe remarks about this difference between American and British soldiers: Most of our boys want first to win the war and then to get home; most of the Tommies want to win the war and then to *win the peace*. Such generalizations are obviously inaccurate and therefore unfair, but they are of more than passing interest when they point a moral for those of us on the home front. Too many people here are unanimous in their demands for victory but are still too far apart in their ideas of our future foreign policies. Most of them feel that we must participate to a greater degree than formerly in world affairs but as yet they can find no practical plan or pattern for that participation.

The agreements reached at Dumbarton Oaks and Bretton Woods are earnest efforts that must be thoughtfully studied, discussed and debated. Peace must soon become the first order of business for all of us. Our own contributions as chemical engineers may well prove the greatest opportunity for public service in the history of our profession. It is time to lift our eyes from our daily duties here at home to get a broader perspective of the job to be done abroad.

TRADE FOLLOWS SKILLS

One of our most important exports in the days to come will be American know-how. Expert engineers and technicians whose services are already sorely needed in many countries of the world will be the best possible missionaries for our products and processes. Technical books and magazines, industrial films, trade missions and exhibits will all help to break down the national barriers and promote a broader market for goods and equipment, particularly in the relatively undeveloped areas of the world.

Since almost the beginning of this century American mining engineers have carried our methods and machinery to the four corners of the earth. Now we see good evidence that after this war there will be comparable or even greater demands for the services of professional chemical engineers in building plants and installing processes and equipment for the production of a wide variety of chemicals and related materials. The trend is already apparent as some of our leading consultants and construction firms are being called upon to survey needs and recommend projects in such countries as India, China and Russia as well as among our good neighbors in South America.

WE MUST ALSO IMPORT

There will always be important markets abroad for American chemicals and allied products provided we do not make the fatal mistake of thinking of foreign trade solely in terms of exports. Instead of constituting a threat to our living standards, a more hospitable attitude toward imports will help to promote higher economic levels in the United States from which all industries will benefit. Furthermore, experience has shown that our foreign markets grow in both volume and value with the advance of industrialization abroad. Thus it is to our advantage to help in developing the industries of the more backward countries so that their demands will increase for refined materials and the more valuable products of our chemical processing.

In addition to the needs for engineering services and equipment and for chemicals and related exports, there is evidence that a number of countries will be in the market for complete manufacturing plants. The civilized world has reason to know of American successes in designing and building completely integrated plants for synthetic rubber and aviation fuels, for synthetic ammonia, nitric and sulphuric acids, explosives, plastics and resins, rayon and other fibers—to mention but a few wartime achievements. When such "turnkey" plants can be built to fit local conditions and under proper licenses or manufacturing rights, there is often a considerable saving in time and money. This was amply demonstrated by our own experience and that of Germany prior to the war.

COMPETITION OR COOPERATION

All of these opportunities involve serious responsibilities which we cannot afford to overlook or underestimate. First always is the question of competition with other nationals. Reference has already been made to Britain's very prevalent and natural desire to "win the peace." Her future is almost wholly dependent upon the recovery

and expansion of her export trade and it is to our interest to help her in that process. The United Kingdom has always been our best chemical market and because of her relatively greater industrialization, England has always been a large user of our engineering services and equipment. Thus it will probably pay us in the future as in the past to work with the British or to work independently but not to work in destructive competition with them. After all, they will be using our raw materials, our services and perhaps even our money in the process of building back their business in the markets of the world.

What about Germany? Presumably she can be written off the books as a factor in world trade for at least a decade. In contrast with the situation after World War I when she regained and expanded her chemical trade in a relatively few years, this time she will have considerable reconstruction to do at home. Furthermore there is certain to be some sort of military, political and economic controls over Germany (and Japan) to prevent the building up of great chemical and metallurgical industries that could again be perverted to war uses.

The various plans for partitioning the postwar Reich have all recognized the fact that the great concentration of industrial power in the Ruhr Valley constitutes a continuing threat to a lasting peace. Here in the tiny triangle which has Cologne as its southern point, Duisburg as its northern point and Dortmund as its eastern point, is concentrated between one-half and two-thirds of all German industry. In certain basic fields, closely allied to ours, the proportion may run as high as 70 to 80 percent. To eliminate the Ruhr would certainly deprive Germany of her war-making potential—an ideal solution from the purely military standpoint. But the price would be prohibitive because dismemberment would upset the economic stability of all of Europe and certainly peril the peace of the future.

The most careful students of this problem feel that we must rely on placing certain of Germany's key industries under strict international control and wherever possible reduce the economic importance of the Ruhr by shifting some of its excessive facilities to other European countries. Again this is not the whole solution. A weakened, badly beaten Germany can some day recover strength and resourcefulness and can overthrow her controls if we do not now make the most of our opportunities for rebuilding the world on the basis of a lasting peace.

A SELLING JOB FOR ALL OF US

International relations as well as postwar adjustments in the United States will both depend, in the last analysis, on the development of a sound program for the production and distribution of commodities. This fact is so obvious that chemical engineers and executives may wonder why we talk about it here. But unfortunately this fact is often overlooked by our national and international planners.

Among all the war agencies, WPB is perhaps the only one that has consistently hammered on the question of goods. Almost every other war agency has dealt with prices, or trade, or politics, or banking, or other economic and social questions. It is hard for these other agencies to sense that economic policy is an academic and meaningless thing until attached to goods and services. Let us consider this a little more closely.

In the postwar era the exchange of goods is all that really matters so far as the development of international trade is concerned. The populations of both "have" and "have-not" nations cannot deal usefully in money, economic sanctions or political boundary questions. Those factors may be important for peace making and peace keeping; but they do not provide food, wearing apparel, housing or the good things we call our standard of living. Only commodities do that.

Perhaps chemical executives and engineers can have some influence in these matters during the next few months. We should always be prepared to show the social significance and the public-welfare meaning of policies that affect production and consumption of our commodities. And these popular interpretations must be formulated so that they will show the job-making possibilities of foreign trade and its contribution to a better standard of living, here and throughout the world.

FOR YOUR INFORMATION

So this 22nd annual review number of *Chem. & Met.* has been planned as a cooperative effort to inform the chemical engineering profession, and the industries it serves, of some of the opportunities and obligations we face as privileged citizens of the United States and of the world. With the help of many able and experienced contributors we have tried to point the direction in which your efforts will be most needed and therefore most effective. Emphasis has been laid on the factors affecting the world market for American chemicals, for chemical engineering equipment and for the services of individual engineers and commercial organizations. Then to give you something of the other side of the picture, we have tried to find out what our customers and prospective customers are expecting from us. More than a score of well informed men from various parts of the world have written briefly of the status of the chemical process industries of their countries and what they have to offer us in exchange for our goods and services.

Finally, to round out our discussion and to maintain the long tradition of these annual review and statistical issues, there is a full quota of the usual studies of economic trends for the various industries and commodities that are of prime interest to the chemical engineer. In all these some consideration has been given to the availability of materials for foreign trade as well as the interrelation of raw materials and manufacturing processes.

The whole falls far short of the much more intensive and comprehensive effort that must be made by each of us as individuals and as members of the chemical engineering profession. No one of us can speak with authority for all chemical engineers or for the whole of the American people. We can, however, each contribute our humble share toward the building of a sounder economic and foreign policy for the United States. Peace will soon become our business. Let's be ready to do our part!

Sidney D. Kirkpatrick

THEODORE M. SWITZ *Director, Export Department, Hercules Powder Co., Wilmington, Del.*

World Markets for AMERICAN CHEMICALS

How can we increase our exports? To what countries can we look for overseas markets? The answers depend largely on their relative degree of industrialization. Here a recognized authority describes a unique tool for gaging both the quality and quantity of materials we can hope to ship.—*Editors.*

At this stage in the war no one can see clearly what kind of political and economic settlement we will get. No one can say with any degree of accuracy what his postwar sales volume will be. In fact, in trying to look ahead and make plans one encounters so many "ifs, ands, and buts" that any well informed chemical engineer or executive would be inclined to consider the problem completely indeterminate and throw up his hands in despair.

But as business men we are compelled to deal with incommensurable and intangible factors as well as with those that are subject to quantitative analysis. Under the circumstances the best we can do is to block out the general framework of probable postwar trade, and then see where the chemical industry and our particular companies fit in the total picture.

PREWAR CHEMICAL EXPORTS

Before we can even attempt a view of the future we must get a bench mark to measure from. How big were our export markets for chemicals before the war? Our chemical industry is relatively so young and is still growing so fast that it is hard to realize that by 1939 nearly 5 percent of all the merchandise leaving the United States was classed as "chemicals and related products." (No petroleum products included.) The actual dollar value of chemicals that year was $163 million, to be compared with a grand total of $3,123 million for all products. The share of the chemical industry more than doubled between 1919 and the outbreak of World War II considered on a price adjusted basis. The trend is evident from the accompanying table.

Total U. S. Exports Compared Exports of Chemicals and Related Products

(Millions of Dollars)

Year	Total	Chemicals
1941	$5,020	$292
1939	3,123	163
1937	3,299	138
1932	1,576	70
1923	4,091	116

Source: Statistical Abstract of the United States

The amount was large enough to present a very worthwhile market for a number of companies; on the other hand, it was small enough to be capable of a considerable percentage growth if a number of conditions, described below, should come to pass.

POTENTIAL CHEMICAL MARKETS

Have you ever marked on a map of your home town the streets you frequently or habitually visit? It is usually a shock to see what a tiny fraction of the total it covers. Market surveys are somewhat similar; they play a useful role in helping the domestic salesman find where the business is; they are even more necessary for efficient selling in the huge and complex field of foreign trade. And to be thoroughly useful they finally have to give definite answers to such questions as "How many pounds of Product A can we sell profitably in France, or in Argentina, this year?"

But in these days when countries are destroyed and whole continents seethe in economic chaos, we decided that in planning for the future it would be necessary to get a general view of the whole world market first. We felt that it would be useful to compare a map showing the geographical distribution of our own company's normal export sales, with a map showing where the *potential* markets were to be found during the same period. An ordinary map of the world would scarcely suffice for it is an even more misleading guide to foreign markets than a regular map of the United States is for domestic sales. Some countries with vast areas and huge populations buy almost nothing; others buy only as much as a city like Cincinnati; some tiny countries buy tremendous quantities on the world market.

This was an observed fact, but how could we measure *potential* demand and show it graphically? Our company is especially interested in the sale of chemical materials and specialties, products that go to other manufacturers rather than to the ultimate consumer. So we were interested in getting an index for the latest normal prewar years (1937-1939) to show *relative degree of industrialization* of overseas countries and also the willingness or ability of a country to satisfy its needs on the world market.

The traditional measuring rod of heavy industry is steel production, and since reasonably satisfactory figures are available for all producing countries, we chose it as

Few chemical engineers have had better preparation for foreign service on behalf of American industry than has Theodore MacLean Switz. His Lehigh Ch.E. in 1922 was followed by a Ph.D. in organic chemistry from the University of London in 1926. He spent 15 years in technical and economic research, chemical engineering production and sales before joining Hercules in 1937.

one of the components of our index. Probably the next most important yardstick of a country's general industrial development, and certainly the key to its chemical industry, is its production of sulphuric acid. Fortunately we were able to get figures for all producing countries from the League of Nations. But some countries show up as zero on each of these scales, and yet have some light industry. To measure this, the only satisfactory worldwide series we could find after a thorough hunt was "number of cotton spindles" which we got from the Yearbook of the New York Cotton Exchange. As a final component we chose total imports, a series that is available for all countries and, in a number of cases, the only one available. Since they were considered to be more specifically indicative of the markets for chemicals than the other series, "sulphuric acid production" and "number of cotton spindles" were each given double weight in calculating the index.

Once the index was prepared, the next step was to lay out a map in such a way as to show the results graphically.

By definition the index for the United States was set equal to 100. The outline of the U. S. was then drawn to a convenient size and its area measured with a planimeter. It was then a simple matter to lay out the areas of all the other countries in proportion to the index. In the violent "shrinkage" that occurred, care was taken to preserve geographical shape and space relationships as much as possible for ease of identification.

The finished map is shown on the preceding pages of this February issue of *Chem. & Met.* As is the case with all maps, it is subject to distortion and does not represent the full truth; nevertheless it is a useful guide. Its value is probably greatest when used as a standard of comparison with a similar map based on your company's own export sales.

This hemisphere, with Europe at the hub, will be interlaced with postwar airlines carrying freight and passengers

PREWAR MARKET SALES

Perhaps the most striking fact to be seen from examination of the map is the large size of the prewar British market—second only to our own. Those who worry about our losing business as our overseas customers become industrialized should take heart from Great Britain, our best prewar customer, yet highly industrialized.

The industrial importance of the leading western European countries was only slightly less than that of Great Britain, Germany following closely behind her. Belgium and Holland were more important than their small size would suggest, while Spain and Portugal were relatively unimportant. The Balkan countries and the Near East were scarcely to be found.

The Soviet Union was close behind Germany as *potentially* one of the largest of the European markets. (Classed as part of Europe rather than Asia, since all buying policies and the pattern of life are established there.) Actually, of course, prewar Soviet purchases were highly selective, based on the needs of her policy of rapid industrialization.

The biggest surprise is undoubtedly Japan. Her *prewar* production index showed her to be comparable to Germany; hardly the paper doll house that some of us thought her before Pearl Harbor!

Our map shows that India was the eighth largest industrial country in the world, a fact that the Indians have been claiming for some years.

China was small, all Africa* was practically negligible, and all Latin America less important than some single European countries. The map thus throws cold water on the ill-considered views of some industrial exporters a few years ago who hoped and believed that South America was the promised land that could fully compensate for the lost markets in Europe. It was a good and important market, small only in comparison with highly developed Europe. The map is also a warning to view the Chinese market realistically.

The experience of most people in active management today does not extend back much beyond the "long armistice" between the two World Wars. And, naturally enough, therefore, most of us are inclined to regard the period as "normal" whereas in terms of any historical perspective it is really thoroughly abnormal. The political instability, the economic chaos were greater than at any time in the past century, and the new economic heresy or autarchy (making yourself independent of your neighbors) came to full flower and bore its poisonous fruit. Our first assumption, then, is that the military equilibrium that will follow the cessation of hostilities will be the most thorough since the end of the Napoleonic Wars at the beginning of the 19th century. The power of Allied arms and the economies on which they are based will be overwhelming.

Assuming that the Big Three can get along together, no other power or combination of powers will approach them even distantly in strength. Political stability, once countries are freed and fed and have passed through a period of readjustment, may be expected to reflect the underlying military realities. Our final major assumption is that, since millions of peoples and their leaders have learned about economics the hard way, the economic settlements at the end of this war will be wiser than after the last. "Autarchy" will no longer be fashionable even for a continental nation like the United States, and we will play our part in the restoration of Great Britain and the invaded countries out of sheer self-interest if nothing else, realizing that we cannot live safely in a world where millions of people are dropping back into

* Africa was inadvertently omitted from the accompanying map of World Markets Based on Relative Industrialization. On the map, Africa has about the area of the Netherlands and values are: Egypt, 0.5; Algeria, 0.4; Nigeria, 0.3; Belgian Congo, 0.2; and Union of South Africa, 1.6.

The remaining half of the earth contains but 6 percent of the world's population and only 2 percent of its industry

barbarism. Consequently, after a transition period, world trade may be expected to flourish as never before.

Probably the first published study to point out that foreign trade might be much higher after the war than ever before, was one put out in the fall of 1943 by the Bureau of Foreign and Domestic Commerce, which somewhat tentatively gave a U. S. export figure of $7 billion in 1948 (compared with the $3–$4 billion mentioned above). Meantime governmental and private organizations in both the U. S. and Great Britain have been making plans with the underlying assumption that the economy must be operated on a level sufficiently high to avoid the millions of unemployed of the early thirties. Recently, for example, a highly responsible private group, the National Planning Association, in a pamphlet entitled "America's New Opportunities in World Trade," estimated that for a typical postwar year (1950) the country will have full employment and a national income of $170 billion. On this basis, if wise policies are followed, we would have a foreign trade amounting to $10 billion! This figure may actually be wide of the mark; what is important is that many different economists, of widely varying viewpoints, anticipate large increases in foreign trade.

Just what fraction of any such total will be supplied by the chemical industry had best be left to judicious guessing until hostilities cease.

Such estimates as those above do not lay any stress on the changed transportation and geography of the world brought about by the airplane. But anyone concerned with foreign trade would be well advised to read and ponder the little book by J. Parker Van Zandt of the Brookings Institution entitled "The Geography of World Air Transport." The maps reproduced on these pages—with the permission of the Brookings Institution—are taken from it and show true hemi-spheres. The one that interests us most is so cut as to include 94 percent of the world population and 98 percent of its industry! Postwar this hemisphere will be heavily interlaced with airlines carrying freight as well as passengers. And for fundamental geographic reasons, Europe will be the hub of the network.

After the war, if our assumptions are correct, Great Britain and Europe will be far and away our largest markets for chemicals. And in all probability they will be larger than even before. One important factor in this situation, and in markets all over the world, will be the probable decline in German competition. It is likely that the German chemical industry will be crippled for years to come by the extensive aerial bombing of its plants and of German industry as a whole, to say nothing of any restrictions that may be imposed in the peace treaty.

If the Soviet Union, as a result of Allied cooperation during the war, can get over its fear of being encircled by a ring of enemies, it need no longer give the bulk of its energy to military production, but could increase the supply of consumer goods. Therefore, it may well become a major consumer of chemicals, although naturally it will always seek to have a fully developed chemical industry of its own.

The Far East, and China, and India in particular, will be worth much more cultivation than we gave them in the past. It would be interesting to examine the opportunities, country by country, but, unfortunately, space does not permit.

Thanks are due to Miss Virginia Howell and Miss Margaret Donnelly who helped prepare the statistical material and to Mr. Robert E. Brubaker who designed the map of potential world markets.

A Five-Point Platform for Foreign Trade

The United States can be the most effective nation on earth in peace as well as in war—if only it knows what it wants. No individual or group can speak authoritatively for the whole of our people, but an honest attempt to formulate sound concepts of national interest in crucial economic matters will help to crystallize American policy. Indicated in broadest outline only, desirable foundations for an economic policy for the United States are:

1. Attainment of a high and sustained level of business activity and employment in the United States and in the world, with the minimum governmental participation possible.

2. Active and expanding world markets for world trade based upon fair competition rather than upon bloc agreements, discriminatory preferences, and cartel arrangements.

3. Encouragement of industrial development in nations which have been backward in that respect.

4. Recognition that hospitality to imports, rather than constituting a threat to national standards of living, offers in fact the most potent instrument for international bargaining that any nation can command.

5. Willingness to assume a responsible national role in international arrangements designed to provide such financial stability as may be needed to support mutually advantageous world exchange of goods and services.

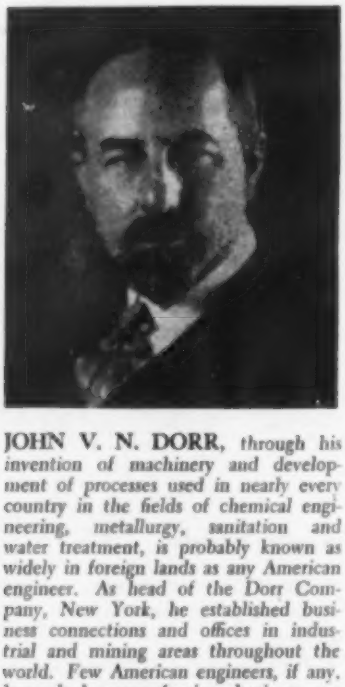
We must see to it this time that the end of military warfare does not merely open the door again to an era of economic warfare.

From an address by John Abbink, executive vice president, McGraw-Hill Publishing Co., before Marketing Conference, American Management Association, New York City, Jan. 5, 1945.

INTERNATIONAL CHEMICAL ENGINEERING

Chemical engineers, as Dr. Dorr so ably emphasizes in the first of the group of articles below, have an obligation to the people of a war-torn world in seeing that the manifold peace-time fruits of war-accelerated developments are applied as quickly as possible to the problems of reconstruction in the postwar period. Not only is this a great humanitarian aim, but it should also carry more tangible rewards than the knowledge of good deeds well done. Still, there are pitfalls in the way of engineers who seek to practice internationally. The eight authors in the group share with the reader some of their experience which should be known to every engineer whose aspirations extend beyond our borders

Postwar Reconstruction Will Benefit From International Chemical Engineering



JOHN V. N. DORR, *through his invention of machinery and development of processes used in nearly every country in the fields of chemical engineering, metallurgy, sanitation and water treatment, is probably known as widely in foreign lands as any American engineer. As head of the Dorr Company, New York, he established business connections and offices in industrial and mining areas throughout the world. Few American engineers, if any, have had more foreign business experience.*

WAR HAS BROUGHT to the world an enormous speedup in technical development. Destruction on a scale never before imagined and a potential demand for new materials and products without precedent is creating for the chemical engineers of all nations, and particularly those of the United States, a challenge and an opportunity far greater than any previously faced by our profession.

Stimulated by grim necessity (classic mother of inventions) and by an urgent and insatiable demand for new products which has been backed by unlimited government funds for research tests and new plant construction, developments usually expected of a generation have been crowded into a few short years. Because total war involves healing and caring for ourselves, our friends and our allies, as well as destroying our enemies, these developments have included not only new and fantastic implements of destruction, but thousands of products that will be of inestimable value to a world at peace. Our engineers are ready with materials which, but for the War, might well have awaited the researches of our children.

THE JOB AHEAD

Chemical engineers who have played so vital a part in these war-time developments should be among the first to appreciate the magnitude of the task ahead. Not only lives and property on a unimaginable scale but, in many areas, the means of existence of those who survive, have been destroyed. Reconstruction alone will require as much time and energy from the engineering profession as they have been giving to the war effort. If we add to this the needs, denied by the war, of people throughout the world, and the pressure from great countries like China and India, which have urgent need for help in developing their resources and improving their living standards, we can scarcely exaggerate the job ahead for engineering in practically every country of the world.

During the years following the first World War, American mining and metallurgical engineers travelled the world, introducing to other countries some of the methods and some of the equipment which had been developed during the growth of large-tonnage, low-grade mining operations in this country. Some travelled briefly, put down no roots, and after the completion of perhaps a few specific jobs, returned in due course to the domestic scene. Others, differently minded or influenced, stayed longer, associated themselves with engineers of other countries and continued to practice their profession and conduct their business on an international basis.

My own organization belonged to the latter group and, although small, became worldwide in its activities and viewpoint. Because we established permanent connections and associations in many countries, and ourselves experienced the resulting benefits and satisfactions, I feel justified in my firm conviction that international cooperation in the engineering field is utterly logical and greatly rewarding.

Chemical reactions are not, like many human relations, influenced by race, nationality or language. Litmus paper turns red in acid regardless of the economic philosophy of the chemist. Commercial production of penicillin will enable doctors to save lives in any country. Chemical engineering today, as always, is a product of minds from every nation under the sun and chemical engineers should by the nature of their work, be completely international in their viewpoint.

If chemical engineers will practice and think internationally, the rewards will be great. Research is enlightened and engineering progress speeded through contacts with the fine minds of other countries, seeking similar objectives although perhaps at the moment faced with entirely different problems. A common interest in anything as absorbing and as universal in its usefulness as chemical engineering should be at least as potent as a common language in helping to unite men's thoughts and spirits, and to heal the scars of war.

The international chemical engineer is vitally needed as an active participant in repairing the damage of war and building the new physical world now possible as a result of his discoveries and achievements. He is needed no less vitally as a catalyst in promoting the understanding and good will without which no permanent peace can be achieved.

Pitfalls Can Be Avoided in Exporting Chemical Engineering Knowledge

Blank-Stoller, Inc.

FRANK G. BREYER, *author of this article, has specialized in chemical and metallurgical engineering since 1910. Since 1927, as a partner of Singmaster & Breyer, New York, his activities have gained him an intimate knowledge of the production of chemicals and pigments based on zinc, lead, and titanium, and of the extraction of magnesium by the ferro-silicon process. Recent consulting work for clients in India has dealt with fertilizer salts, and for other clients in South America, with the Tainton process for zinc.*

Except for that with Canada, the foreign business of the American engineering profession over the years has not generally been as desirable and profitable as domestic business. The upsurge in foreign business following the last war, particularly, left behind a trail of wrecks and skeletons that has served as a warning against too hasty entry into this field.

Like all generalities, the foregoing statements are subject to many limitations. Geological, mining and petroleum engineers have had their foreign business activities established on a sound basis for a long period of time. Individuals or organizations offering highly specialized engineering services and highly specialized equipment can also be listed as soundly established and not dependent in any way upon such temporary financial props as war or postwar emergency financing or lend-lease. While these exceptions to the unfavorable generalities mentioned above are important, they still leave the foreign market, in our minds at least, a "step-with-care" area. A study of the disappointments, failures and wrecks along the path of engineering service in foreign lands has led the author and his associates to some important conclusions, which we ourselves are using as a guide in seeking and accepting foreign business on an increasing scale:

1. Most foreign engineering business is either not planned in the sense that domestic engineering expansion is ordinarily planned, or if it was planned, it was planned for too short a time. Outstanding practitioners of foreign business, like the English, set their plans, so far as we can find out, for 10 to 25 years ahead and do not expect too much in the way of returns in the first five years.

2. In the past, too few engineers have realized the importance of, or have been willing to accept foreign partners—or if not foreign partners, then at least a considerable foreign participation in the overall venture. It is our conclusion that business has to be done through and with the people and engineers of the country where the job is to go. We see only increasing nationalism and self-sufficiency economies ahead. This is particularly so in solvent countries or countries with large or potentially large exportable surpluses.

3. Engineers, not being capitalists or international exchange experts, should stay out of deals involving payment for equipment or services in foreign monies or obligations, or in terms of foreign government or industrial bonds and stocks.

4. Although selling engineering services independent of equipment is more difficult in foreign markets than in domestic, nevertheless the same advantages accrue abroad from such independence as at home. These advantages are absence of prejudice, freedom of selection and quickest adaptation of new developments.

5. Our fifth conclusion is that one should deal only with principals. If we cannot get business direct and if our transactions cannot be handled directly, then we want nothing of it.

Frankly admitting that foreign business on a permanent and profitable basis is a challenge, we think that this challenge should be accepted only on the same basis that a new process or a new equipment set-up is accepted as a challenge. The surely successful approach is not known. It should be tackled on the same basis as any development program is tackled, that is to say, with an appreciation that no over-all return may be expected in less than three to five years and that progress should be on a limited or semi-commercial equivalent scale, first, before undertaking too large commitments.

While the author's concern may be said to be only just out of the semi-commercial scale on foreign work, we have been studying such business for years, primarily because of our close contact with the mining business which has been successfully carved out by American engineers all over the world.

Putting all we know together, we find woes on both sides. First, foreigners generally grant us technical capacities we don't have. Second, they feel that we're so rich that our profit margins must be very great and that, consequently, an equipment manufacturer can afford to give away engineering services free or a processing company can give away process knowledge without regard to cost. There is not by any means a real conception of the fact that American business of all kinds lives on a very slender margin indeed, and must account for every bit of its knowledge, time and services if it is to survive.

Foreigners, generally, appreciate fully how far we are ahead in many fields but fail to realize that this keeps us in a constant state of flux. There is little practice that can be called standard in the United States. If it's standard, it's probably out of date. When foreign industrialists come here to buy a new industry or new process, they usually get one that proves to be out of date. That is because they want to keep the whole thing in one package—process, know-how, equipment and erection. American industry is ahead because it ordinarily divides these factors of industry into several functions.

Good equipment people can not be good process people, except in a very limited sense. Good process people are not good erectors. Most foreigners must be persuaded, against their own convictions, that engineering comes first in America and must come first if the same up-to-dateness and over-all economy are to be realized abroad as are realized here.

TEAM WORK WINS

Americans do lots of things well but their best accomplishment is team work. We get the best results because we put the greatest variety of talent on the job and that talent works together as a team.

Foreigners usually feel that we put too many different experts to work on a single job. However, in America, we are much less secretive about processes and know-how. On that account we realize more fully how little any one man or any one group knows, as compared with the combined knowledge of many experts in a field. There is nothing so likely to lead to disappointment as an American engineer or group of engineers accepting the foreigner's appraisal that he knows it all, or at least knows enough to cover a whole field of human endeavor.

Agents, merchants, politicians and those "highly placed" politically are supposed to know how to buy good engineering services, processes or plants. There is no question that lots of American exports, particularly following the last war, were of the kind that such people would get. What they bought they were not competent to judge. They made their decisions on hearsay or the "hunch opinions" of experts off

the job. Their services were too often judged by their ability to keep price low.

American engineers cannot accept foreign business without accepting a major degree of responsibility for supporting the thing on which all foreign relations rests, namely, two-way trade. The American public is more likely to accept the necessity for imports when that necessity is honestly and truthfully set before them by engineers whose capacity is proven by accomplishment, than when it is proclaimed by politicians or the legal-minded whose information is second-hand. Foreign business will last only as long as our "war generosity" unless there are imports. It is the duty of the American engineer to proclaim publicly that the world is a big place, with good things distributed pretty widely. He must point out that one way to share these good things is by international swapping.

It is fortunate that American engineers are not interested in foreign politics, in the ordinary sense, so the admonition to stay out of it is less necessary than with the engineers of some other countries. So long as American engineers design and build with the same pride and interest abroad as at home, they will be all right, by and large, no matter who governs. Good works speak for themselves in any man's language.

Many foreign people believe that business in America is all big, a belief that must be combated seriously. We know that America is mostly "small business" and that the best of big business is that which feeds to the ultimate consumer through a multitude of small channels. For every big invention there are a hundred small ones, many never patented or even considered patentable, that make the big one an economic and financial success. Foreign interests need not deal with overpowering business giants to reach any industry in America.

Know-how on any subject is widely scattered. It can be assembled, and is assembled in small packages, by small groups who set up new competition every day. That is the real reason why Americans are where they are today, and one reason why sound foreign investors can and will get more for their money here.

Postwar Trends Toward Economic Self-Sufficiency Will Need Much American Engineering

Affiliated Photo-Conway

CHESTER L. KNOWLES, *who is technical director of the General American Process Equipment Division of General American Transportation Corp., New York, followed an earlier period of chemical research and development engineering with more than 20 years in sales engineering and direction of sales engineering in the process equipment field. Since much of this work was for export, his opinions of international engineering are well founded.*

MOST COUNTRIES spent the 20 years between the two World Wars striving for economic self-sufficiency. Some of these nations were preparing for war, and their aim was to obtain economic independence in wartime. Other countries were interested from a purely economic viewpoint: capital was seeking profits, and governments were anxious to raise living standards.

The result has been quite remarkable. Areas which formerly were only the source of agricultural products and raw materials were converting rapidly to industrial economies. The Soviet Union is the most notable example of this change. But we have also seen in India the development of a sugar industry as well as the start of a steel, heavy chemical, and paper industry. In South America, iron and steel, aluminum, cement, and chemicals are now being produced. Plans were being made for the development of an aluminum, cement, and paper industry in the East Indies. Japan, of course, intensified the industrialization of its home islands and of the Asiatic continental areas it occupied. With the exception only of certain colonial possessions, wherever raw materials were available throughout the world, plans for their local industrial utilization were under way.

What was the effect of this trend upon world trade? In the long run, it no doubt resulted in the international exchange of fewer consumer goods. If cars had not been manufactured in Russia, or light bulbs in Japan, our export trade of those items undoubtedly would have been greater. On the other hand, international markets for capital goods were greatly stimulated. Obviously, no non-industrial areas of the world could be industrialized without the importation of capital goods. The United States, Great Britain, and Germany were the principal suppliers of such goods. Switzerland, Belgium and France participated to a minor extent.

During the decade preceding World War II, German competition in world markets was invariably accompanied by some form of political or economic pressure. The totalitarian economy of Germany permitted the establishment of rigid export-import regulations, exchange clearing controls, and often business was secured at sacrifice prices for the purpose of obtaining foreign exchange. The British chiefly concerned themselves with trade within the Empire, and the preferential Empire tariff was a serious handicap to American exporters. Capital goods manufactured in the United States were exported largely on a merit basis. In spite of the many handicaps and obstacles that had to be overcome, our goods found markets in most areas of the world, including continental Europe. In many cases foreign manufacture, under license, of American processing equipment represented the only means of insuring the adoption of our designs and engineering skill. This had to be done in Great Britain, for sale within the Empire and frequently in Dominion territories, as well. At times, ingenious compromises were adopted to side step foreign trade restrictions.

The question now arises: Is this trend to economic self-sufficiency likely to continue after the end of this war, or is the hope for removal of trade barriers likely to lead to freer world exchange of consumer goods, and the consequent abandonment of plans to industrialize agricultural and raw material producing areas?

There is every indication that the prewar trend of industrialization will continue and that its rate of development will depend upon the international arrangements that are made for financing it. There is certainly no lack of desire on the part of the Russians to rebuild their industries in the devastated areas, or even to expand them; nor on the part of the Chinese to industrialize on a very large scale. The Latin American countries intend to forge ahead with new industries; while Indian capital is certain to come out of hiding and invest in fertilizer, paper, textile, and chemical industries, etc.

AMERICA'S OPPORTUNITY

The best and only immediate source of supply for the capital goods that will be required throughout the world will be in the United States. Prewar competition for an extended period will be greatly reduced or completely eliminated as Great Britain and Germany will have much to do at home. On the other hand, we will probably welcome our Canadian neighbor, with its war-expanded industries, into an in-

portant participation in the responsibility of rebuilding the world. The following picture, therefore, seems to be outlining itself when the war ends. Liberated European and Asiatic countries will look to Uncle Sam for means with which to rebuild their destroyed industries. Most other inhabited and raw-material-producing areas of the world also will look to us for means with which to establish new industries and so raise standards of living.

The problems of financing this important prospective trade had better be left to statesmen and economists. The question whether our taxpayers or bondholders will foot the bill, or whether we will accept in payment the products of foreign labor, can lead to much speculation. It seems quite probable, however, that we are going to extend a helping hand to our war ravaged allies, and help them rebuild their economics. It is in our self-interest to do so, and thus seek to prevent the development of chaotic conditions which would otherwise follow the end of the War.

Certainly, much process equipment and many plants will be built in these foreign countries, and those in the United States prepared to handle this business will do well. Food products, high in proteins and vitamins, will be required for undernourished areas, and many plants extracting or manufacturing these products will doubtless be built.

IN WHICH LANDS?

To mention just a few countries, France will, of course, be rehabilitated. South America will require plants for the extraction and processing of vegetable oils, for recovery of byproducts from sugar, and in some areas, plants for concentration of citrus juices and the re-working of citrus wastes. In India, heavy chemicals will be produced; plants for the beneficiation of raw materials will be in demand, as will plants for the production of pest- and insect-control chemicals. Sugar byproducts will be recovered, and there is considerable interest in the recovery of valuable products from pineapple waste and the concentration of the juices. In the Philippines, there will be many metallurgical plants to be rebuilt, and many sugar operations. In the Caribbean, alcohol byproducts will be of considerable interest. In China, the heavy chemical, sugar, alcohol, and cement demands are arousing considerable interest, and in Russia, even now, recovery of coal, beneficiation of minerals, production of heavy chemicals, etc., are demanding much attention and capital.

It is a debatable question whether the policy of helping in the creation of new producers, instead of customers for our consumer goods, will hurt us in the long run. Perhaps it eventually will. But we should have sufficient faith in ourselves to believe that we shall go on having a finer and more beautiful house, even though, at present, we help our neighbors rebuild their own.

The author desires to express his appreciation to his colleague, Roman Chelminski, for collaboration in the preparation of this brief article.

Americans Can Sell Their Share of Chemical Engineering Despite Higher Costs

Blank-Stoller, Inc.

ALAN PORTER LEE *has been associated with the industries based on oils and fats since 1908. President of Alan Porter Lee, Inc., New York, he has been engaged in consultation and process development for nearly 20 years, much of it for clients in Central and South America, Mexico, Canada, India, Egypt and Europe. He speaks, therefore, from personal experience in discussing postwar professional problems.*

During the course of the past 14 years, starting with the "Mukden Incident," there has been one predominant factor in world-wide international relations. This factor has found two major types of expression, both originated and fostered primarily by those shortsighted nations who have called themselves the "have-nots." Impolitely referred to as "the grab," this factor has been developed politically through outright military seizure of the lands and property of the weak, and commercially, through manipulation of international finance and through the subtleties of the cartel system.

Assuming that the postwar period will bring forth a workable formula for international relations, let us turn to an examination of the prospects for American engineers to participate in the rebuilding of the world. It is the opinion of the writer that our possibilities for rendering constructive service are absolutely unlimited in scope. The productive and manufacturing facilities (at least those devoted to the peaceful arts) of all Europe, including England and European Russia have been practically destroyed by the ravages of war. This is true also of China, the East Indies, the Philippines and North Africa and certainly will be true of Japan.

Because of the preoccupation of Britain, the United States and Germany with war production during the past six years or more, these three greatest equipment producers have been unable to supply the remainder of the world with mining, agricultural or processing equipment. The industrial plant of all nations, in consequence, is depleted. Existing equipment is badly in need of repair or replacement.

At the close of hostilities, American engineers and equipment manufacturers will face a world wherein each nation will be clamoring for the means of peaceful exploitation of its own domestic produce. American scientific and engineering ability has been thoroughly proven, as has American capacity to produce efficient machines. Our armed forces with their ships, artillery and small arms, but particularly with planes, jeeps, bulldozers, draglines, lighting plants, refrigerating units, telephone and radio sets, cinema projectors and even with the humble electric fan, have been the world's most potent trade missionaries.

We cannot, however, afford to sit back and demand that this unlimited market come to us, for the privilege of being served, on our own terms. There still remains powerful competition. Our British friends also must live. A reconstructed France will demand its share in the heavy equipment markets, in addition to those for perfumes, laces, linens and objets d'art. Holland and Belgium will once again develop substantial process equipment lines. Canada, Australia and India will struggle to establish and maintain engineering trades, as will Russia.

Then there are neutrals, such as Sweden and Switzerland which, while British and American production for the peaceful arts has been suspended, have been developing their heavy engineering industries apace. Germany and Japan will probably have their hands full with internal reconstruction and external reparations for some years, but must be considered as potential aspirants for the world's process equipment trade.

Our first approach, as engineers, indubitably must be toward the rehabilitation of the basic process industries of our allies and the smaller nations of Europe, particularly those industries which underlie the food, shelter and clothing trades. For any reasonably early return to a normal peace economy, the people must be fed, housed in warmth and clothed. Whether international settlements will be made on the basis of Lend-Lease, reparations, exchange of produce or what-not

need not be the concern of the engineering profession, to whom it is simply a job to be done.

It is inevitable that the same sort of job must be done for the enemy countries, no matter how it may be controlled and supervised by the Allied Nations to prevent resurgence of the aims and means of war. Here is a vast occupation for American engineers, to be conducted concurrently with modernization of our own process industries here at home.

Then there is the demand from our neighbors in Latin America, who, although they have fortunately escaped the major ravages of war, have been unable to obtain the materials to develop, maintain or extend their process industries. This demand alone could possibly occupy all the export facilities of the equipment builders of the United States for several years to come.

There are the markets! How shall we secure the business? How shall we execute it? How handle prices, shipments, exchange, etc.? We in this country must remember that our costs and sales prices are generally higher than those of our competition. We must maintain our policy of most advanced engineering design, with efficiency and quality of materials second to none. People throughout the world are generally willing to pay more for proven superiority in quality. Our sales approach should stress the operating economy of our equipment and the quality of the production therefrom as primary justifications of its higher cost. We must and can legitimately emphasize the facts that American engineering design and machine tool work are the best available in the world and that American brains have excelled and will continue to excel in the development and management of process and production equipment.

ROOM FOR ALL

We must not attempt to corner all engineering business. There is still room in the world for all. Our bankers must recognize accepted methods of export financing and extend reasonable foreign credits to responsible purchasers. The matter of trade balances must be seriously considered and we must all remember that no nation can indefinitely afford the burden of an unfavorable balance. Still, this idea should not become a bogey-man since it is the total balance, rather than that with any individual nation which is important. The so-called invisible factors, such as the tourist trade and immigrants' remittances, often aid materially in final adjustments.

Basically, however, we must continue to absorb as much as possible of the produce of those nations to whom we wish to sell. Furthermore, wartime measures must not be permitted to carry over into times of peace to the extent of preventing bona-fide transactions in equipment or services because of arbitrary governmental refusal to permit the purchaser to transmit the necessary funds.

One feature of engineering export trade which has been largely neglected in the past by Americans and which it is believed deserves more attention, is the export of engineering knowledge, rather than of machines. In many countries of the world, domestic conditions favor construction of plant at home, but plans for modern equipment are lacking. It is recognized that American firms hesitate to send construction plans indiscriminately to foreign purchasers, feeling that such procedure often leads merely to promotion of competition, but it is believed that in many instances a bona-fide user can and will pay well for engineering design from this country and will jealously protect the information from all comers, for his own benefit as well as for that of the engineers who supply it.

Complete Chemical Plants—f.o.b. America Delivered Anywhere in the World

Unsigned for reasons of company policy, this article comes from a firm of engineers and builders actively engaged in the development of chemical processes and the design, construction, and initial operation of complete production units. The company has made hundreds of installations in the United States and has erected plants throughout the world from Latin America to the Far East.

In the shaping of a common victory over the Axis Powers, the United Nations are finding that they have common aspirations in the building of a better world—aspirations which presumably will find their greatest expression in the expansion and development of foreign commerce in the immediate postwar period. To the under-industrialized and non-industrialized countries in particular, the recognition of these aspirations has given impetus to the initiation of new enterprises based (1) on the utilization of native raw materials and (2) on the expectation that the United States will furnish the necessary engineering talent and technical assistance for their development.

It is said that in the development of industries in foreign countries, the cooperation of the United States will be indispensible in technical matters, although the financial and commercial aspects of such cooperation are not yet clearly defined. With the exception of one foreign country, the pattern of industrialization is still incomplete. For these and other reasons the exact form of our cooperation in the postwar period is not yet clear.

We may assume, nevertheless, that American chemical engineering, which has rolled up such an imposing record of accomplishment and success in this generation of amazing progress, will inevitably play a leading part in the design and construction of complete chemical plants in foreign countries. First of all, we have considerable know-how to offer. We have practical methods and equipment of advanced design. We can construct plants with high efficiencies and usually at substantial over-all economies. The speed and efficiency with which we designed, constructed, and put into operation the huge chemical and petroleum plants vital to the war effort will attest to our ability.

Part of our achievement can be ascribed to the cooperation of existing chemical engineering service organizations. These service organizations possess exclusive chemical engineering design data, background and cumulative experience in nearly every type of chemical processing. They are thoroughly equipped to undertake and assume entire responsibility for the design, construction, and initial operation of complete chemical plants anywhere in the world and are experienced in the many problems arising from plant construction in foreign lands. They will prove invaluable in the many cases where it will be necessary for foreign clients to acquire licenses or rights to basic processes. Complete service in foreign countries may be made to include the selection and hiring of native labor for preparing sites, transporting materials and equipment, and for carrying out erecting details under the supervision of field engineers.

ACTIVITY COMMENCING

There is considerable evidence of current activity in the application of American chemical engineering practice to the international scene. Successful foundation of a chemical enterprise almost invariably demands close and careful study of related industries, sources of raw materials, types of suitable processes available, market requirements, transportation facilities, and other interrelated controlling factors. The aid of American chemical engineers in the evaluation of such factors has already been invoked. In some few cases initial arrangements to acquire rights to American chemical processes have been concluded. Preliminary designs, estimates and contracts for construction of certain types of chemical plants are in preparation. Representatives and technical personnel from foreign countries are now in this country surveying the manner in which our chemical engineering could best implement the creation and expansion of their postwar chemical industries.

Problems That Must Be Met in Developing Chemical Industries in Foreign Lands

CHARLES O. BROWN, *consulting chemical engineer of New York, has been closely associated with important chemical engineering projects in many parts of the world, especially in the fields of ammonia synthesis and alkali manufacture. Having learned at first hand the sorts of difficulties that must be met by American engineers and equipment manufacturers who go beyond our borders, he has willingly consented to pass along some of what he has learned.*

When this war is over there will undoubtedly be a great deal of activity in the development of chemical industries in various foreign countries. These activities can be divided into two classes. Some of those countries that formerly were well established in this field have had their chemical plant facilities destroyed by the ravages of war. They will want to rebuild and modernize their operations to the fullest extent. Other countries which have not previously been large factors in the chemical industry will demand such developments as a basic part of their programs of postwar industrialization. This type of expansion means not only new plants but also new personnel and manufacturing organizations. These countries, in particular, must depend very largely upon the know-how of foreign engineers who may be engaged to handle these projects.

There is another important and essential difference between the two situations just described. Countries and companies formerly engaged in the chemical manufacturing industry have a certain degree and type of confidence that is lacking elsewhere. They have a certain skill in estimating market demand and, therefore, in appraising the size of the manufacturing plants they will require. Quite the opposite is true in those countries which have not previously been engaged in heavy chemical production, especially in the smaller ones where the economic situation as a whole is very uncertain. They do not have the confidence and the ability to estimate market demands nor to determine the scale of their manufacturing requirements. The tendency in such countries is usually to decide to build a small pilot plant as the first step in getting started on any proposed development.

Experience has clearly shown that pilot-plant programs of this type are seldom essential. Let us assume that a foreign country which does not enjoy a favorable balance of trade and whose currency is not valued abroad at anything like par, decides that it wants to build a soda-ash plant. The tendency for such a country is to propose that a very small plant be erected in order to test out the raw materials and the manufacturing process, as well as the local markets. At the same time the country wishes to find out whether its personnel can manage and operate such a plant. Usually this is both unwise and unnecessary. The soda-ash business has been so well developed in the United States and in certain European countries that a competent alkali engineer can study the problem and recommend the exact size of plant that will fit the economy of the country where the building is to be done. Or he may frankly and promptly advise against such an operation.

There is little or no necessity for a pilot plant in any process which has been highly developed and is well understood elsewhere in the world. A new company can capitalize on the experience of other countries. It can profit from the pilot-plant knowledge gained elsewhere and can accept with confidence plant processes and designs based on past experience of competent engineers who will, wherever possible, insist that the first development should be as large as the economy of the country will permit in order that maximum operating efficiency can be obtained.

NO "SCRAP IRON" PLANTS

Those who had the experience will also recall that after the last war a great many small countries asked for, and some developed, plants for fertilizer production. Unfortunately, we have seen that some of these, particularly in Japan and Norway, have become embarrassing to the Allied nations because they have been converted to the manufacture of munitions. Fertilizer plants can produce fertilizers and as such produce more food. We might carry the comparison further. Plants producing fertilizers to increase the food supply are indirectly munitions plants, inasmuch as food is a munition of war. A certain note of caution will probably be demanded of all engineers in Allied countries in the development of chemical industries abroad, to make certain that potentially unfriendly countries are given types of equipment and plants that will help them increase the comforts and standards of living, but which can not help them to wage a war of aggression. Preliminary expressions of policy to be followed toward the aggressor nations after the war indicate that chemical and other plants which are adaptable to war production may be drastically curtailed or even destroyed completely. In at least one instance the British have already insisted on this policy.

The general subject of fertilizer production is arousing the keenest interest at the present time in all foreign countries. Many are employing their best technical men in investigating plans for the production of all kinds of fertilizers, with particular attention to those commonly used in the United States. It is to be noted that many of these countries are looking into the production of electric-furnace phosphorus for phosphoric fertilizers. This presupposes hydroelectric installations which always add to the fundamental wealth of any country in providing jobs and income. That, after all, is an objective greatly to be desired by all American engineers.

After fertilizers, greatest interest seems to center on the basic inorganic chemicals. Such materials certainly must come first in any program of chemical development. Plastics, fine chemicals and other fancy organics follow. A case in point is in Turkey where the government is undertaking a survey to establish policies for the development of a completely integrated industry. This is certainly a healthy policy for any country to pursue. In Turkey the first inquiry originated from an interest in soda ash and sulphuric acid. Plans for caustic soda and potash followed shortly after. Next Turkey turned to minerals, especially to copper which offered an opportunity to use some of the heavy chemicals mentioned above.

Certainly the single and most logical policy for us to follow is that we should plan all of our advances upon a well balanced economy of buying from, as well as selling to, foreign countries. In almost every nation we find that the internal financial situation may be quite satisfactory for the time being, but decidedly weak from the standpoint of outside purchases. Obviously, this will influence the manner in which the various countries will develop their chemical industries. In other words, their natural preference will be to import engineers rather than outside engineering advice and foreign-built equipment.

In this connection we would like to sound a note of warning and point out that the Germans, both as key men in various government-dominated industries, and as individuals possessing or thinking that they possess valuable technical knowledge, will immediately "go underground" after the War by moving to foreign coun-

tries and engaging in the chemical business. From past experience, it may be expected that these Germans will carry with them proposals for establishing almost every conceivable type of chemical industry. They will have the dual purpose of surreptitiously exporting large funds for safe keeping, to be invested in industries and properties; and of developing secretly ordnance and other instruments of war to make possible the return to power of the present Nazi party. For several years past the Nazis have forbidden the sending of funds to neutral countries, but we predict an immediate change encouraging the big technical and industrial companies to get as much money out as possible in order to make a living and further their postwar aims. It is believed the Nazis are even now requiring certain industries to establish their key men in small hidden "technical offices" and active "research bureaus," whose existence will be known to only a few in control. It has been done before.

Few people in the United States realize how many Germans were established in this country and left at the time of the invasion of Austria. Most of these men were in key salaried positions in our chemical and allied industries and almost overnight they packed up their families and returned to Germany. The writer knows personally of several such men who left plants in the rayon and plastics industries. Looking back today, the photographic companies now have occasion to scrutinize very carefully exactly what went on during the years 1936 to 1941, in order that they may avoid a repetition of such treachery in the future. We predict these activities will be transferred to neutral countries on a much larger, improved and perfected scale after the defeat of Germany. Our engineers working in foreign countries must be alert, and carefully interpret conditions as they find them.

German engineers will undoubtedly offer stiff competition to legitimate American engineers and firms with wares to sell abroad. It has happened before and will happen again. Their competition will be doubly hard because they have been accustomed to a much lower scale of living and there is always the possibility that they will be subsidized.*

These notes on the place of chemical engineering in the world situation would not be complete without some reference to the excellent quality and fine abilities of American chemical engineers, as well as to the character of the information and the facilities available for their use. The writer recalls that while operating an engineering office in Paris he received many and frequent requests by European companies of well established reputation for the names of chemical engineers who had been educated in the United States. There was always the feeling on the part of the inquirer that such men had a broader and more fundamentally useful training than any European chemical engineer. This, of course, refers to the average man and makes no allowance for the relatively few brilliant minds who will probably continue to give very creditable accounts of themselves in the world's chemical industries.

* Recent information from what is believed to be a reliable source in Europe suggests that 300,000 Germans from the Nazi army and technical staffs have been designated to leave that country at the cessation of hostilities in order to go to foreign countries and start research and development work subsidized by Germany, if possible and necessary, on new war-useful inventions.—C.O.B.

Industry's Wartime Challenge Has Primed American Engineers for World Tasks

GEORGE A. BRYANT, *president of Austin Co., Cleveland, Ohio, has directed wartime efforts of one of the largest U. S. firms specializing in the construction of complete plants for chemical process operations. In outlining the opportunities awaiting American engineers in foreign countries, he has drawn upon a lifetime of experience in designing, building, and equipping chemical plants both at home and abroad.*

THE STAGE is set for postwar development of chemical, process, mining and extraction industries on a scale which can be expected to call engineers to almost every corner of the world. America's development of new chemical processes, and synthetic materials which are far more than ersatz, is rapidly breaking down world-wide dependence on certain crops, mineral deposits and other resources obtainable only in specific countries. With water, coal, air, limestone, various forms of plant life, and other widely obtainable materials coming into use as the basic ingredients in an ever growing number of products, the prosperity and growth of countries everywhere may very well depend just about as much on sound, well-rounded development of their process industries as it does on the mere use of native ores and other long-standing natural assets.

No one recognizes this any more than the great inventive leaders of our chemical industries whose research work has been the means of so much progress. For where their development of nylon, synthetic rubber, and the magnesium from sea water process upset the previous values of silk, natural rubber and certain mineral deposits, they opened the way for extensive self-development within any country which can justify the establishment of plants licensed to make such products.

As long as the proportionate cost of transportation and distribution keeps going up while raw material and production costs are coming down as the result of technological improvements, the localized development of many industries will, to a large extent, influence living costs in many parts of the world. And since living costs determine wages, and wages the cost of production, it should be obvious that world-wide achievement of optimum living standards will depend on each country's doing for itself whatever it can do as economically as any other country.

The same factors which are giving rise to a desire for better living standards in other lands are sure to assert themselves in the form of ultimate pressure for better working conditions as well. Thus, while no one expects the world to achieve American standards overnight, anyone who is building a new plant—wherever it is—will do well to give serious consideration to measures which affect the worker's health and welfare as well as to things which mean increased production efficiency or improved quality of product. Recognizing the speed with which labor movements can influence employee thinking, it will be wise to anticipate possible future requirements and make provision for adequate employee facilities in the original layout, even if they are never installed. Where health hazards are inherent in processes themselves, the modern ventilating, air conditioning, dust control and other equipment now available removes the last excuse for perpetuating conditions which have heretofore been responsible for many occupational diseases.

In setting up the production facilities which have enabled us to out-produce the rest of the world, American engineers have had to develop techniques and equipment which have largely revolutionized modern industry. Nowhere have the changes come faster or with greater impact than in the chemical and process fields.

Starting in some instances with location surveys and proceeding through all the phases of detailed engineering, construction, and equipment purchasing to the final installation of process machinery, this work has required the development of extensive

canals, water supply and waste disposal systems, dams, roadways and power generating plants, as well as the facilities for production itself. With projects that ranged from small penicillin laboratories to hundred-million-dollar plants for the extraction of magnesium and bromine from sea water and salt brines, the exacting character of precision controls and the proportions of construction work have been without parallel.

In keeping up with the never ending chain of process improvements which set the specifications for their work on the one hand, and the constant development of new and better equipment which increases production efficiency on the other, engineers responsible for translating flowsheets into operating plants have acquired a know-how which is available to chemical industries the world over. Always ready to work with established equipment manufacturers in the development of new process machinery and devices, if they feel the best available is still not good enough, these engineers have been the means of speeding up some processes and simplifying others.

WE OFFER TECHNIQUES . . .

New construction techniques developed in the face of wartime material shortages and experience gained in the installation of military facilities in totally undeveloped, isolated localities should find widespread application in the establishment of new process industries abroad.

Huge prestressed concrete tanks, like those which our engineers designed for the Navy's gasoline and fuel oil storage depots, for instance, may frequently prove a happy solution to bulk storage problems, especially in countries where steel plate is not readily obtainable. Already used in pulp and paper industries, such tanks can be adapted to virtually any use by application of suitable lining material. Concrete may play a very important part in meeting many structural requirements in isolated localities, particularly in the light of new precast systems which can be applied in everything from harbor works to walls and roofs.

In the chemical industries, where the lack of a single valve or fitting sometimes cripples an entire plant, standardization which permits maximum interchangeability of parts and requires a minimum inventory of replacement items will prove desirable, just as it has in our own wartime experience. This will be particularly true of the plants far removed from established industrial centers.

The steadily increasing value of welding as a tool in meeting widespread construction needs may well reach a new high in postwar work for chemical and process industries, especially in the more remote localities, where welders are frequently jacks of all trades. Welding not only simplifies many aspects of design in structures, pressure vessels, tanks, boilers, evaporators, stills, stacks, agitators, kilns and steam and process lines, but greatly reduces the number of special items of all kinds on the job. And with power to run a welding machine available at the job site, any breakdown in equipment can usually be repaired without delay.

. . . AND PROCESSES

Important as design and construction techniques are in the solution of chemical industry problems, it is the changing character of processes which usually creates the ever-present need for new and better plants. The recent change within our own pulp and paper industries, for instance, in which southern slash pine achieved major importance as a source of newsprint and rayon pulp almost overnight, may well be followed by parallel developments abroad. This might well mean that some of the larger textile importing countries where climatic conditions are conducive to the growing of slash pine but not of northern spruce or cotton from which most pulp was heretofore obtained, might set up their own pulp and rayon industries in years to come.

The rapid depletion of high-grade ore reserves during the war period has set the stage for far-reaching developments in this field at home and abroad. While it is generally agreed that the next decade will see the opening up of many new deposits in this country, it is only logical to expect the development of mines overseas even sooner in the light of postwar prospects for the metal industries abroad. In many instances, the character of the deposits and their location with respect to established or prospective metal producing centers will make the erection of special plants for ore beneficiation an essential counterpart of economical operations.

Whereas today the world's largest producer of vitamin-A oils extracts that valuable concentrate from the livers of soup-fin sharks in a single small plant in the Puget Sound area, this plant is supplied by fishing fleets that operate all the way from San Francisco to the Bering Sea. They bring their catches to gathering plants at many different points along the coast, where the livers are removed and reshipped for final processing. The efficiency gained in this way may well find a parallel in other industries which could use intermediate handling and processing stations to save long hauls on nonproductive bulk from which products of concentrated value can be easily removed.

It is hard to think of processed foods as bulk items in the same sense as cement, steel or fertilizers, but many of those which have become mainstays in the diet of the more advanced nations are among the bulkiest products of all. Certainly as the demands for such products spread abroad, we can look forward to the erection of cereal mills, canneries and packing plants everywhere. This will automatically create the need for glass and other container plants, which in turn will require basic stocks of paper for boxes and carton manufacture, tinplate for cans, and bagging for sacks.

Few fields hold greater promise for widespread foreign development than the fertilizer industries, which have a direct bearing on the health, living standards and potential purchasing power of people everywhere. While some countries may not be able to justify the establishment of fertilizer plants geared up to our standards of production efficiency, many of the principles incorporated in the most advanced American plants will have to be adopted generally if foreign producers in the non-industrial countries expect to hold their own markets against open foreign competition. It will be up to American engineers to help such plants strike a happy medium, in which the more advantageous methods and controls can be utilized without replacing manpower by machinery any more than the economics warrant. Thus while conveyor handling of materials is sure to be employed to eliminate backbreaking labor, such systems will probably lack the automatic trip switches and other conveyor control devices found in our more up-to-date plants.

. . . AND EXPERIENCE

In many process industries the question of relative efficiency of bucket, belt and pneumatic handling systems will have to be faced; the effectiveness of different mixing devices will have to be considered; and packaging procedures will have to be analyzed. When industries in all parts of the world put problems like these—and all the problems of layout, structural design, water purification, waste disposal, efficient power generation, and production controls—up to American engineers, they will get answers which reflect the cumulative experience gained in the most intensive period of development the chemical industries have ever known.

Where foreign countries stand to get far-reaching benefits from experiences of American industry with a minimum of growing pains, we should profit by ever-expanding markets that will far outweigh in dollar value the cost of setting up production activities abroad. Production industries like ours, which have demonstrated their capacity to design soundly, equip economically, and work efficiently, should never have to fear the loss of leadership in international trade as long as they maintain the same high standards in management and engineering which brought them through to supreme accomplishments in this critical war period.

Some Personal Aspects of Foreign Service For American Chemical Engineers

JOHN C. JACOBS, *a former editor of "The Georgia Tech Engineer," took a four-year "post-graduate" course in process control engineering with Standard Oil at Baton Rouge. Now for over a year he has been in foreign service with a related company, Creole Petroleum Co., at Caracas, Venezuela. His experience has thus given him the answers to questions often raised by younger engineers who contemplate foreign service.*

ONCE ONE comes to appreciate the unbounded opportunities for engineers in foreign service, he is confronted with the inevitable question of why more men from the United States are not eager to seek and fill such positions. In general, the answer to this question seems to lie in the lack of readily available, exact information regarding living and working conditions in the various foreign countries. What information is available is likely to be contrasted adversely with considerations of the excellent living conditions in the United States. There is also a person's natural tendency to want to live in his native land. Too often the young engineer gets the impression that foreign work is not as up-to-date from an engineering point of view, and that it will not afford him as broad experience as at home.

To clarify this picture, let us first consider the characteristics of foreign service as compared with domestic service and second, consider certain commonly held misapprehensions concerning foreign service.

THESE ARE FACTS

1. The chance for rapid advancement. As contrasted to the United States where the majority of engineering jobs are with larger and more completely developed companies, the engineer will find that most opportunities for foreign work will be with new concerns that have an inevitable expansion period ahead of them, with commensurate advancement for the men who "get in on the ground floor."

2. The chance for a broader engineering experience and a more responsible type of work. In the larger domestic companies where engineering departments are completely organized and fully staffed, we often find that the degree of specialization is proportional to the size of the engineering department. For example, in some large companies, design work may be specialized to the extent that one man does nothing but record field test data, another does nothing but size pressure vessels, while another may do nothing but estimate costs. The obvious error in this system is that it does not develop the well-rounded point of view that completes the training of the young engineer. Foreign service, on the other hand, has the advantage that because of the urgency and quantity of work and the shortage of technical personnel available, a chemical engineer may find himself correlating field test data, making process and mechanical designs and cost estimates, and even writing contracts during a single day.

3. The chance to earn more money. Foreign work will give an engineer approximately one-third more base pay than he will get in the United States, together with a bonus (usually) for foreign service, and a cost of living allowance on top of all that. Most companies provide employment benefit plans for their expatriated employees which are equal to or more liberal than those provided for domestic employees. The higher salaries are essentially the result of the economic law of supply and demand.

4. The chance for broader personal experience. The experience of studying and becoming acquainted with new people is inevitably going to give the engineer a broader personal experience which should be of great value to him in dealing with others. The point of view gained by seeing commonplace things done in new ways, i.e., experiencing the customs of another people, is invaluable. While business in the United States tends to be carried on more and more in set form, there is still a certain "horse-trading" aspect to foreign business relations which is most interesting and satisfying.

5. The chance to be a fully "socially conscious" engineer. One characteristic of the average young chemical engineer in the United States is his inability to realize his so-called "obligations to society." That is to say, he finds it difficult to appreciate his place in the community, the effect of his work upon its economy, and the full social implications of his technological decisions. In foreign service, such myopia is well-nigh impossible. In those rapidly developing parts of the world, where the wonders being wrought are so readily in evidence, where the importance of the engineer to society is so obvious, an engineer will clearly feel his moral obligations to the commonwealth and adjust his decisions accordingly. In addition, in these troubled times, especially, every expatriated citizen is more or less of a diplomatic envoy and the knowledge of this status helps to crystallize an awareness of the sociological implications of engineering work.

THESE ARE FALLACIES

Finally, let us consider some of the more prevalent misapprehensions concerning foreign service for chemical engineers:

1. The living conditions abroad are poor. This, of course, will vary with the job but, in general, you will find that housing, food and entertainment are equal to that in the United States. Most of the so-called "undeveloped" countries are ahead of the United States so far as air travel is concerned. Living will certainly be more leisurely from the standpoint of having more attention from servants.

2. The place is unhealthy. This, too, will vary with the job. However, the extensive precautions taken in jungle areas to control malaria and other diseases, coupled with work done by the foreign governments (in cooperation with the United States in many cases) and the modern hospital facilities—provided by the companies in rural areas and by the municipalities in larger urban areas—usually result in a percentage of illness no larger than usual, and in medical care equivalent to that available in the United States.

3. Operations abroad are so out-of-date that there will be no chance for experience with modern processes or equipment. As a matter of fact, the processes and equipment used in foreign plants are usually as modern as any in the world. This is the result of their newness and the increasing amount of communication (trips by engineers, flow of technical publications and ease of shipping equipment) between different parts of the world. It follows also from the fact that companies are unlikely to install and maintain any but the most profitable processes and equipment.

4. It's just too far from home, that is, it would be extremely difficult to get home in case of emergency. Spectacular advances in air transport are rapidly reducing the effectiveness of this argument.

In conclusion, it should be pointed out that the chance for broad engineering experience, for being advanced to positions of greater responsibility, and for saving some money, is several times as great in foreign service as in domestic service. Wise indeed are those engineers who take advantage of these fortunate circumstances and work at least for a time abroad.

Latin America Looks to the United States

Latin America at this time is looking to the United States as never before for practical assistance and guidance in the industrial awakening that is occurring in most of the countries south of the Rio Grande, writes Frank Hodson, member of 1942 American Technical Mission to Brazil, later technical advisor to that government and now in a similar capacity to the Colombian Government (Instituto de Formento Industrial). This awakening is the logical outcome of decades of insufficiencies and dependence on more aggressive industrial nations, but the time has come when many of these southern neighbors will insist on more complete utilization of their own natural resources in power, minerals, foodstuffs, agriculture.

In several Latin American countries, government and semi-government agencies, known as "Formento Industrials," have been established for the purpose of encouraging this cooperative effort. Some of these agencies have already established a number of new basic industries largely managed and operated by American engineers, and in some cases jointly American and locally owned.

Of practical assistance to the small newly organized chemical plants of Latin America would be the surplus, slightly used equipment, perhaps somewhat obsolete by modern U. S. production methods.

It would greatly stimulate business now and after the war if reliable concerns in South America could purchase equipment without having to send cash with every order and wait months in hope an export license will be granted. If such purchases could be passed through government channels of both countries and arrangements made whereby the customer paid 25 percent down and the balance in 2 to 3 years, a large volume of business would result.

Agents from other countries are all over Latin America seeking after-war business and promising extended credits. Orders are being placed for substantial amounts of equipment. If agents from American firms could offer equal terms they would be given the preference.

When doing business in Latin America arrangements should be made to make everything economically possible in the foreign country, using local labor for assembling North American and local materials. Technical direction should be in the hands of Americans, but young engineers of the local country should be trained in North American plants for eventually operating the plant. Arrange either through United States government agency or privately to give up to two years credit for equipment when sold to firms approved by Formentos government agencies. In the case of supplies part cash and credit of six to twelve months should be allowed. Representatives going to Latin America should speak the language of the country.

Directory of Foreign Purchasing Agencies

Below is a list supplied by the U. S. Bureau of Foreign and Domestic Commerce, providing names of individuals and addresses of semi-permanent foreign purchasing and supply commissions in the United States. It is impossible to provide a complete list, since some of the commissions are temporary and leave the United States immediately after completion of their missions.

Argentina. Rear Adm. Alberto D. Brunet, Naval and Air Attache; Col. Alfredo Paladino, Air Attache; Brig. Gen. Antonio Parodi, Military Attache, Embassy of Argentina, 1816 Corcoran St., N. W., Washington 9, D. C.

* **Australia.** War Supplies Procurement, 1700 Massachusetts Ave., N. W., Washington 6, D. C.

* **Belgium and Belgian Congo.** Belgian Congo Purchasing Commission, 630 Fifth Ave., New York 20, N. Y.

* **Bolivia.** Lt. Col. Alfredo Pacheco, President, Bolivian Army Purchasing Commission, Room 1038 Investment Bldg., 15th & K Sts. N. W., Washington 5, D. C.

* **Brazil.** Lt. Col. Miguel Lampert, Chief, Brazilian Aeronautical Commission, 3402 Garfield St., N. W., Washington 7, D. C.; Oswaldo B. Sampaio, Brazilian Government Airplane Engine Factory Commission, 60 E. 42nd St., New York 17, N. Y.; Cmdr. Benjamin Sodre, Officer-in-Charge, Brazilian Navy Purchasing Office, 3007 Whitehaven St., N. W., Washington 8, D. C.; Col. Stenio Lima, Chief, Brazilian Military Commission, 2134 Leroy Pl. N. W., Washington 8, D. C.

* **British Empire and Colonial Purchases** other than Empire countries listed elsewhere: British Colonies Supply Mission, 908-910 G St., N. W., Washington 1, D. C.

* **Canada.** Department of Munitions and Supply, Marshall Bldg., 1205 15th St., N. W., Washington 5, D. C.

* **Chile.** Vice Adm. Emilio Daroch, Chilean Naval Commission; Maj. Gen. Oscar Herreros W., Chief, Chilean Air Force Commission; Chief, Chilean Military Mission, 2128 Bancroft Place, N. W., Washington 8, D. C.

* **China.** Agency of the Republic of China for Lend-Lease Procurement: Chinese Supply Commission, 2311 Massachusetts Ave., N. W., Washington 8 D. C.; Purchasing Agents for the Republic of China: Universal Trading Corp., 630 Fifth Ave., New York 20, N. Y.

* **Colombia.** Lt. Col. Rafael Sanchez, Military Attache, 910 17th St., N. W., Room 207 Barr Bldg., Washington 6, D. C.

* **Costa Rica.** His Excellency Francisco de P. Gutierrez, Ambassador of Costa Rica, 2112 S St., Washington 8, D. C.

* **Cuba.** Military Attache; Lt. Cmdr. Felipe E. Cadenas, Naval Attache; Capt. Efrain R. Hernandez, Air Attache, Embassy of Cuba, 2639 16th St., N. W., Washington 9.

* **Czechoslovakia.** Czechoslovak Embassy, 2349 Massachusetts Ave., N. W., Washington 8, D. C.

* **Dominican Republic.** His Excellency, the Ambassador of the Dominican Republic; Capt. Amado Hernandez P., Military Attache, Embassy of the Dominican Republic, 4500 16th St., N. W., Washington 11, D. C.

* **Ecuador.** Gen. Luis Larrea-Alba, Military and Air Attache, 2125 Leroy Pl., Washington 8, D. C.

* **France and French N. Africa.** Christian Valensi, President, French Supply Council, 1800 Massachusetts Ave., N. W., P. O. Box 3157, Washington 9 D. C.; Mission for Industrial Procurement, Andre Armengaud, Chief, 2900 Adams Mill Road, N. W., P. O. Box 3157, Washington, D. C.

* **French W. Africa and Colonies.** Pierre Pelieu, Acting Chief, French Colonial Supply Mission, 111 Broadway, New York 6, N. Y.

* **French Military Mission.** Gen. Brossin de St. Didier, Chief, 1759 R St., N. W., Washington 9, D. C.

* **Great Britain.** British Ministry of Supply Mission, 15 Broad St., New York 5 N. Y.; British Ministry of Supply Mission, 1800 K St., N. W., Washington 6, D. C.; British Supply Council in North America, 1800 K St., N. W., Washington 6, D. C. (also Willard Hotel) (mail address: P. O. Box 680, Benjamin Franklin Station, Washington, D. C.)

* **Greece.** Greek Embassy, 2221 Massachusetts Ave., N. W., Washington 8, D. C.

Greenland. Danish Consulate General, Greenland Section, 17 Battery Pl., New York 4, N. Y.

* **Guatemala.** Dr. Enrique Lopez-Herrarte, Counselor, Embassy of Guatemala, 1614 18th St., N. W., Washington 9, D. C.

* **Haiti.** His Excellency Andre Liautaud, Ambassador of Haiti, 4842 16th St., N. W., Washington 11, D. C.

* **Honduras.** His Excellency Julian R. Caceres, Ambassador of Honduras, 2611 Woodley Pl., N. W., Washington 8, D. C.

* **Iceland.** Iceland Purchasing Commission, Fuller Bldg., 595 Madison Ave., New York 22, N. Y.

* **India.** Indian Supply Mission, 635 F St., N. W., Washington 4, D. C.

* **Iran.** Iranian Trade and Economic Commission, 30 Rockefeller Plaza, New York 20, N. Y.

* **Mexico.** Brig. Gen. Luis Alamillo Flores, Military Attache; Commo. Ignacio Garcia Jurado, Naval Attache, Embassy of Mexico, 2829 16th St., N. W., Washington 9, D. C.

* **Netherlands.** Netherlands Purchasing Commission, 744 Jackson Pl., N. W., Washington 6, D. C. (also 41 E. 42nd St., New York, N. Y.).

* **New Zealand.** New Zealand Supply Mission, McGill Bldg., 908-910 G St., N. W., Washington 1, D. C.

* **Nicaragua.** His Excellency Guillermo Sevilla Sacasa, Ambassador of Nicaragua, 1627 New Hampshire Ave., N. W., Washington 9, D. C.

* **Norway.** Royal Norwegian Purchasing Mission, 3409 Fulton St., N. W., Washington 7, D. C.

* **Panama.** Narciso E. Garay, First Secretary, Embassy of Panama, 2862 McGill Terr., Washington 8, D. C.

* **Paraguay.** Col. Luis Santiviago, Military Attache to the Paraguayan Embassy; Lt. Cmdr. Amado Daniel Candia, Naval Attache to the Paraguayan Embassy, 3722 Harrison St., N. W., Washington 15, D. C.

* **Peru.** Capt. Manuel R. Nieto, Peruvian Naval Commission; Col. Armando Revoredo, Air Attache to the Peruvian Embassy, 1320 16th St., N. W., Washington 6, D. C.; Col. Jose M. Tamayo, Chief, Peruvian Military Commission, 1301 15th St., N. W., Washington 5, D. C.

* **Poland.** Polish Embassy, Commercial Counselor, 1422 F St., N. W., Washington 25, D. C.

Portugal. J. Freire de Andrade, President, Portuguese Purchasing and Trade Commission, 630 Fifth Avenue, New York 20, N. Y.; Portuguese Purchasing and Trade Commission, Wardman Park Hotel, 2660 Woodley Rd., N. W., Washington 8, D. C.

* **Russia.** Amtorg Trading Corp., 210 Madison Ave., New York 16, N. Y.; Lt. Gen. Leonid G. Rudenko, The Government Purchasing Commission of the Soviet Union in the U. S. A., 3355 16th St., N. W., Washington 10, D. C.

* **El Salvador.** His Excellency Hector David Castro, Ambassador of El Salvador; Lt. Col. Gilberto Carmona Sosa, Military Attache, Embassy of El Salvador, 2400 16th St., Washington 9, D. C.

Spain. Luis G. Guijarro, Commercial Counselor, Commercial Office of the Spanish Embassy, 1629 Columbia Rd., N. W., Washington 9, D. C.

Sweden. Swedish Government Cargo Clearance Committee, 630 Fifth Ave., New York 20, N. Y.

Switzerland. Swiss Cargo Commission, 444 Madison Ave., New York 22, N. Y.

* **Turkey.** Turkish Supply Office, 2202 Massachusetts Ave., N. W., Washington 8, D. C.

* **Union of South Africa.** The Union of South Africa Government Supply Mission; Government of Southern Rhodesia, 905 15th St., N. W., Washington 5, D. C.

* **Uruguay.** Col. Medardo R. Farias, Military Attache for Air; Lt. Cmdr. Alfonso Delgado, Naval Attache, Embassy of Uruguay, 1010 Vermont Ave., N. W., Washington 5, D. C.

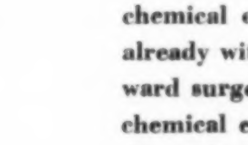
* **Venezuela.** Col. Juan Jones-Parra, Military Attache; Lt. Cmdr. Aristides Rojas, Naval Attache; Maj. Josue Lopez Henriquez, Air Attache, 1129 Vermont Ave., N. W., Washington 5, D. C.

* **Yugoslavia.** Yugoslav Embassy, 1520 16th St., N. W., Washington 6, D. C.

• **The President has declared the defense of countries so marked to be vital to the defense of the United States and thereby eligible for Lend-Lease assistance. Consequently, the Foreign Economic Administration, Washington 25, D. C., may be able to provide additional information regarding the sale of goods and materials to such foreign governments.**

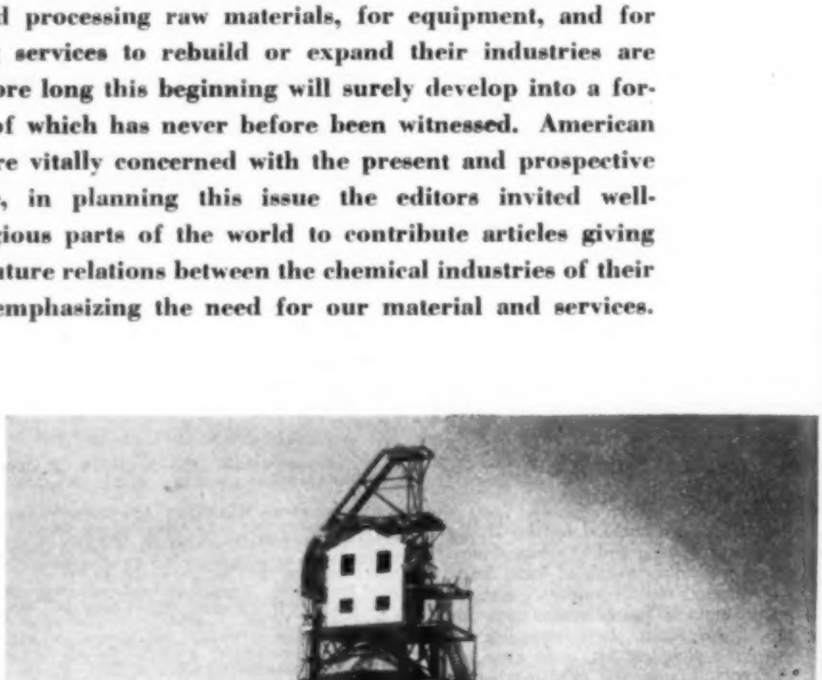
WHAT THE WORLD EXPECTS FROM

The beginnings of a demand from many foreign countries for American chemicals and related processing raw materials, for equipment, and for chemical engineering services to rebuild or expand their industries are already with us. Before long this beginning will surely develop into a forward surge the like of which has never before been witnessed. American chemical engineers are vitally concerned with the present and prospective demands. Therefore, in planning this issue the editors invited well-informed men in various parts of the world to contribute articles giving their views as to the future relations between the chemical industries of their countries and ours, emphasizing the need for our material and services.



CANADA

***G. L. WHITE,** as general manager Canadian Chemistry and Process Industries, is a leader in the discussion of the future of these industries in his native country. Mr. White graduated from the University of Toronto in 1933 with a degree in chemical engineering, and at once entered the editorial field.*



N. F. B. photo

Since the start of the war large scale chemical developments have been brought about in Canada at a cost of many millions of dollars

CANADA, prior to the war, produced a broad range of basic chemical materials for her larger industries. She imported especially from the United States, Great Britain, and Germany tonnages of essential chemicals that could not be manufactured advantageously even with some protection against imports. The import-export trade balance generally stood against Canada in chemicals. With certain exceptions Canada did not aim to export chemical products and was not a large factor in world trade. The exceptions were those materials where there was quite an outstanding advantage in cost especially of electric power or some raw materials in which Canada was quite favorably placed. In the main, participation in international markets in a really competitive sense was slight, since a high percentage of Canadian production was based on protected home market requirements. The industry existed wholly in private hands and was strongly held by capital from the United States and Great Britain. A limited number of large corporations concerned primarily with mining or with hydroelectric power operated subsidiary corporations concerned with chemical and electrometallurgical products.

During the war, for reasons arising from the course of events, Canada, up to the end of 1943, developed over 50 new chemical and explosives projects of which nine could be said to be privately owned. The cost of these works varied from 1 to 19 million dollars each, with the Canadian Government, in effect, directly supplying an unusually high percentage of the capital required. This process has continued on a much reduced basis during 1944. In addition, and not included, have been expansions in the production of many items under private control, and the above does not include a plant valued at 55 million for the production of synthetic rubber and such progress in new plant as has been undertaken to produce liquid fuels.

Leaving out such production as may be required for explosives, which presumably must cease at the end of the war with Japan and which may be stepped down in the interval, some of the principal materials that Canada may expect to be able to produce in large quantities and at low costs are nitrogenous fertilizers and products based on electric furnace operations.

The Canadian home market depends on the extent to which Canada is able to develop trade in agricultural, mineral and forest products, and her primary resources generally. These have been the basis of her domestic chemical economy, and she must approach the postwar world either with the possibility of applying her excess chemical capacity to domestic industries that can consume a portion of the additional production, or she may anticipate the opportunity of joining with others in direct sales to countries that have not developed similar capacity up to this time. The fact that public funds have been so heavily and directly concerned with investments in this field would make it reasonable to suppose that the government would be especially interested in international trading arrangements of a chemical

THE UNITED STATES

DIRECTORY

nature. Of course, Canada also has a well developed series of manufacturing operations that consume the usual quotas of chemicals.

Canada thus presents a complex case that will require a great deal of study on the part of her own government and people. To be understood properly her position must be well studied and appreciated by other nations. Canada has a comparatively small population, a large portion of which is concerned with primary production, and a great range of needed materials capable of further manufacture; and at the same time has developed industries that show growing kinship to those to be found in certain countries where natural resources do not exist and where imports of raw materials for the maintenance of the population may be set off by exports of finished goods. In addition, her economy is particularly sensitive to her export-import relationships.

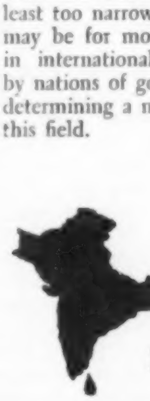
What Canada may then hope to purchase abroad will remain partly in the chemical and chemical equipment field and those items that have not been manufactured within the country to date and probably will not be undertaken until a much larger market exists. It would seem reasonable to assume that a considerable amount of specialized chemical plant would be required in due course. During the war Canadian chemists and chemical engineers have acquired a body of experience that has enriched their ability. Gains have been made in some fields of research but on balance it is reasonable to assume that Canada will continue to import a great deal of mental property arising from research carried on elsewhere.

In a way, the problems of Canada and the United States will be comparable in any postwar trade world. The difference in size of the operations introduces factors hard to estimate but both countries are concerned with primary and secondary industries and both possess relatively large groups of trained personnel capable of carrying on all kinds of engineering or scientific work. Canadian problems, therefore, might be expected to be much more similar to those of the United States than to any other single country, and Americans will understand them somewhat easier than other nationals.

Limiting the trading relationship to Canada and the United States, the former offers the closest source of many materials that can be made the basis of exchange arrangements. This trade exists in relatively large volume for export and import business prior to the war and has continued throughout. It might be beneficial in an over-all sense to both countries if the volume could be increased in some agricultural items or if it could be stimulated in fertilizer materials. In return Canada is a large importer of liquid and solid fuels. Canadian forest products, in terms of lumber and paper, have always entered the United States in considerable volume. Canadian standards of living, tastes, and values are more comparable to those of the United States than to any other country and the problem of trading between the two is that of the amount of business that can be done between two neighbors who with some determination and goodwill set out to do a bit of business together.

Where more classical trading conditions are to be met, the problem may seem easier because the flow of raw materials balances the flow of finished products, but Canadian-American relationships represent something much more complex and yet desirable, namely, the problem of trade between large and small groups of peoples on about the same fairly high and uprising scale of living conditions.

Social matters are unpredictable with engineering precision and much former economic thinking has been bad, or at least too narrow. The need of the future may be for more experimental economics in international relationships undertaken by nations of good will with the object of determining a more scientific procedure in this field.



INDIA

VAMAN RAMCHANDRA KOKATUR ***received his B.Sc. degree from Bombay and his M.S. and Ph.D. from Minnesota. He was employed by several American chemical companies before returning to his native land as general manager of the alkali works at Dhrangadhra. Recently he has served as captain in the Chemical Warfare Service. Since his return to civilian duties, Dr. Kokatur has been most concerned with plans for industrialization of India.***

In the decade immediately following the end of this war there will probably be only two technologically and industrially advanced countries capable of exporting manufactured products and engineering services. The countries that figured in such export before the war, such as Germany, France, Italy, Belgium, Holland, Czechoslovakia, Austria and Japan will have been crippled in manpower, plant and finance. Their complete recovery will require at least ten if not fifteen years. Therefore, they will be out of the picture so far as export is concerned, leaving only Great Britain and the United States to compete for the job of international industrialization.

England has suffered severely because of bombings and the long continued draft on her manpower and resources. Her own reconstruction program will immediately require much of her technological and productive power for home use and it may be some time, therefore, before they can be largely applied for export purposes. Some British economists believe that she will require as much as five years to reach her prewar productive capacity.

Industrialization programs for China, India and Russia will probably receive greater attention than those for the rest of the world. Among these three, India seems to have some advantages. Her domestic market is about as large as that of China, but is undoubtedly further advanced in trained manpower, internal and external transportation systems, financial resources and, above all, in the developed industrial capacity for utilizing her natural raw materials. War has not penetrated directly into India and hence there has been no destruction of plant and property. Next to Japan, India is the most industrialized nation in all Asia, Africa and the Near East. During the war she has been the chief arsenal of supply for small arms, munitions and other materiel used in the adjacent theaters of war.

The total sea-borne trade of India is the order of over one billion dollars in normal times. Within eight or ten days' water route, India has a potential market of 600 million people to the east and about 250 million people to the west. India has a greater ratio of coast line to area than any other large country. Hence it has cheaper transit routes for export than either China or Russia. India has more gold than almost any other country except the United States and certainly more than China or Russia. But let's look

next at her resources and industries of interest to chemical engineers.

India has plenty of medium-grade coal and some of the higher quality. A limited amount of oil is available but from the long-time view this is overshadowed by her very great potential resources of hydroelectric power. Bombay has long been one of the most completely electrified cities in the world.

India has a very high-grade of iron ore and is noted for her production of manganese, chromite, magnesite, ilmenite, monozite and bauxite. Among the metals only platinum, nickel and cobalt are lacking. Salt and saltpetre, barytes and beryl, sulphur and pyrites, copper, lead and zinc are available.

India rates very high among producers of manganese, ilmenite, monozite, mica, shellac, jute, myrabolans, sandalwood oil, castor beans and cashew nuts. India is the largest producer of oilseeds and sugar cane, the second largest producer of cotton, rice and legumes. In short, India is very favorably situated with regard to her natural resources and certainly the algebraic sum of her industrial potentials is much greater than that of most undeveloped countries, not excluding China and Russia.

Coal Tar Industry Needed

If Indian industrialization is to take place along the lines of her natural resources, she will have to have a well developed coal-tar industry, with all its usual offshoots. This means she will require technological and engineering help in coal-tar distillation and the production of synthetic pharmaceuticals, dyestuffs and intermediates, insecticides, wetting agents and other synthetic organic chemicals. India has the third largest textile industry of the world and this requires sodium compounds, bleaches, sizes, sulphonated oils, alkalis and mordants. Plants to produce these compounds are sorely needed. There is a definite demand for a rayon industry since India formerly imported large quantities of rayon yarn from Japan. She has all the raw materials and is definitely in the market for at least six rayon or synthetic fiber plants. India grows some natural silk and has a fair sized woolen industry. The jute industry needs a technological revamping in certain of its phases. The shellac industry is quite primitive and therefore needs mechanization and technological improvements. India exports more than 60 percent of the world's crude botanical drugs. But she needs plants for grinding and extracting these crude medicinals.

Of course, the prime necessity, as with so many other undeveloped countries, is for fertilizers so that food crops can be greatly increased. India does not produce enough food to support her population of 400 millions and there are recurring famines. She could double her food production with tremendous benefit to the health and vigor of her people. Such a plan is entirely practicable if modern fertilizers are scientifically used in her agriculture. American engineers are at present engaged in designing and building an ammonium sulphate plant in Travancore, which is especially important because rice and legumes are the staple crops in India and these can be greatly stimulated by nitrogenous fertilizers. Were it possible to build and operate modern synthetic ammonia and electric-furnace phosphoric acid plants with a capital of a half million dollars or less there would be a demand in India today for at least a dozen such works.

Demand for Paper

In spite of low literacy, India has a large and increasing demand for paper. That produced domestically is made from imported pulp and it is believed there is room for capacity to produce at least 100,000 more tons of paper per year. Unfortunately, there are no large resources for wood pulp, but the important annual crops of bamboo, sugar-cane bagasse, corn and other stalks that can be used for raw material, as well as various grasses and reeds, should be developed for that purpose. Since India requires rayon production in addition to various types of paper, it is essential that some other raw material than wood be utilized as a source of cellulose.

India uses an enormous amount of glass and has a sizable industrial production. All Indian women, except widows, wear on both wrists a dozen or more fancy colored bangles that serve as bracelets. Most of these have been imported heretofore from Austria. Since India does not make industrial glass, she would like to make these bangles too. Women of higher economic levels have begun to use bangles made from plastics and some Indian industrialists have been talking about plans for producing suitable synthetic resins. Benzol and formaldehyde are both being produced in India today and hence a synthetic phenolic resin plant is entirely feasible.

India (including Ceylon) produces about 5 percent of the world's natural rubber. Dunlop and Firestone have already started factories to manufacture tires in India and local capital is looking forward to starting another factory to make various mechanical goods and toys from rubber as well as from latex.

Reference has already been made to the fact that India is a large producer of the various types of oilseeds that enter into the commerce of the world. Therefore there is need of oilseed crushing and extraction plants to produce cooking and salad oils and shortening compounds as well as oils for paints, varnishes and lubricants. Hydrogenated peanut oil is in great demand for shortening as well as a substitute for the ubiquitous melted butter known as "ghee." Butter as such is not much used in India due to its perishable nature in the Indian climate. Lever Bros. operate two plants in India but there is a definite need for several smaller soap factories that could also recover glycerin.

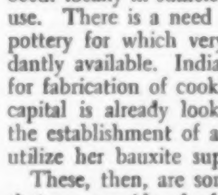
As the largest cane-sugar producer, India has a large amount of byproduct molasses which could be fermented to yield alcohol and yeast. There is a ready market for power alcohol and for solvents to be used in the extraction of drugs. The market for yeast, however, has yet to be developed despite the prevalent protein deficiency. Yeast could be used both as a food and as a vitamin supplier, particularly because a large majority of the people are averse to the use of animal protein.

It has recently been reported that Indian capital is now arranging to purchase several small electrolytic caustic-soda plants. There is also an immediate market for a large quantity of scientific apparatus for a hundred or more colleges and universities in India. India also plans to establish a national chemical laboratory after the war and a scientific mission is visiting the United States at the present time to inspect various research facilities. Experienced teachers of chemical engineering could find ready employment in some of the schools in India.

India is one of the largest exporters of raw hides but has not been successful in several attempts to develop a leather industry. The difficulty seems to be in the lack of proper engineering. Certainly various tanning, curing and dyeing raw materials are available in plentiful supply.

So far India has only one well developed metal industry. This is for the production of iron and steel and owes its existence to American engineering service and enterprise of the late C. P. Perrin. If India is to build automobiles and airplanes it is essential that she should also have a ferro-alloys industry and, as has been previously mentioned, practically all of the needed minerals except cobalt and nickel occur locally in sufficient quantity for such use. There is a need for more china and pottery for which very fine clay is abundantly available. India imports aluminum for fabrication of cooking utensils and her capital is already looking to America for the establishment of an industry that will utilize her bauxite supply.

These, then, are some of the industries that are considered of immediate need in the postwar period. India has resources and the other factors that make for a great industrial potential. Can America supply the technological pressure that will bring about her needed industrialization?



MEXICO

FRANK WELDEN JESSEN *received his undergraduate and graduate training in chemical engineering at the University of Texas. After receiving his Ph.D. degree in 1933 he joined Humble Oil & Refining Co. at its Houston plant. More recently he has been in Mexico serving as a chemical engineering consultant for Petroleos Mexicanos and other process industries.*

Up to recent years, Mexico's chemical industry consisted of a few old plants producing acids, coal tar solvents, rubber, and pharmaceuticals, under the direction of Europeans or Americans. Recently, millions have been invested in new chemi-

cal projects, a large number of which resulted in failures because of a lack of know-how. The investors believed that it was more economical to do their own experimenting than to employ competent chemical engineers to install and operate their plants. As an example, some three years ago a plant was constructed for the production of organic acids in which several millions were invested. It has never produced one ounce of material. Likewise, a government alkali project was started eight years ago at a cost of several millions without results until recently when a large American enterprise entered the undertaking as technical partners.

Like most of the Latin American Republics, Mexico is desirous of becoming industrialized. However, the lack of essential know-how has caused investors to lose a considerable part of their enthusiastically invested capital.

The biggest "bugaboos" of Mexican industry in general are the protective tariff and the new law whereby new industries are exempted from taxes and import duties on basic raw materials and equipment. These were primarily intended to attract investors. Such protection should tend to stimulate the development of industry. However, it works as a boomerang because related industries, whose operations depend largely upon chemicals, must pay considerably higher prices for these domestic products than they were accustomed to pay for the imported materials; consequently their own finished products have to be sold at prices often three or four times those prevailing prior to the domestic production.

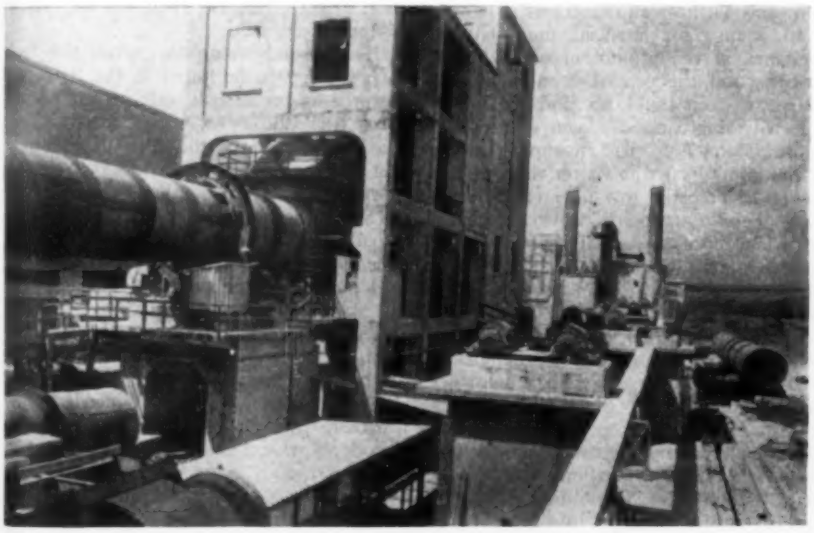
These tariff-protected industries, instead of basing their selling price upon the production cost, calculate what the imported products would cost under the new tariff schedule and then sell their domestically produced wares at the same prices.

The producers of basic chemicals, instead of operating on a volume turnover, limit their production so as to avoid a drop in local selling prices, which is the natural consequence of abundant supply.

Normally Mexico consumes chemicals valued at $15,000,000 per year and, since the purchasing power of the Mexican people is constantly rising, it can reasonably be expected that after the war this volume will be increased. Most likely the largest part of this consumption, if not all, will have to be supplied by the United States.

Among the chemicals in greatest demand are coal-tar distillates, alcohol, aniline, glycerine, medicinals (coal-tar derivatives), turpentine, plastics, paraffin, methyl alcohol, detergents, flotation agents, solvents for paints, caustic soda, soda ash, mineral acids, and phosphates.

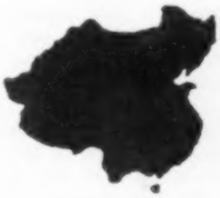
It is interesting to note that of the above mentioned chemicals, the plastics industry requirements seem destined to offer the greatest possibility for rapid postwar expansion and development, though in the production of various others increased productive capacity will be forthcoming.



Erecting dryer at plant of Cemento de Mexico. Equipment needs will be tremendous if industrialization proceeds as expected

Equipment needs of chemical industries will be tremendous if the rapid industrialization of the country proceeds as expected. In practically every field, except perhaps petroleum, which is obtaining aid through other government agencies, lack of equipment has been a constant hindrance. As an example may be cited the plastics industry. Although production has been curtailed by shortages of various materials obtainable from the United States, the lack of equipment has proved an insurmountable obstacle. Many manufacturers of plastic moldings have already made preparations for enlarged facilities when machinery again is made available to them. On the other hand, it appears that the alcohol industry will be self sufficient for many years to come.

There is room and urgent need for the establishment of chemical engineering consultant firms specializing in the construction of plants, complete processing, and operation. In fact what Mexico needs most for its incipient chemical industry is chemical engineering consultants. The picture of the chemical industry in Mexico is somewhat obscured by recent failures, yet the future seems quite attractive.



CHINA

TE-PANG HOU. *No Chinese chemical engineer is better known in the profession than Dr. Hou, who completed his education at M.I.T. and Columbia before returning to his native country to serve as chief engineer and works manager of the Pacific Alkali Works at Tangku, Hopei. He is the author of the popular ACS monograph on alkali manufacture and last year was made an honorary member of the Society of Chemical Industry of Great Britain.*

INDUSTRIAL development in China may be said to have started in 1927 when the unification of the country was completed. The invasion of Manchuria by Japan on Sept. 18, 1931, added impact to this movement which from 1931 to 1937 brought about the greatest industrial progress ever made in the whole long history of China. There was a great expansion in the production of cement and alkalis and in the textile industry. A good start was made in iron and steel, pulp and paper, and in the fixed nitrogen industry during this short period, although chemical engineering applications were comparatively new in China.

It was this rapid development that caused the Japanese militarists to advance their time-table of conquest. Ironically enough, it was not the internal dissension or civil wars in China (as one might suppose), but her unification and her very rapid development once that unification was attained, that precipitated the Japanese invasion in 1937. Unfortunately, such chemical industries were mostly developed in the coastal province of China and have now been occupied or destroyed by the enemy.

It is scarcely to be doubted that the period following the peace of World War II will see another rapid development of the Chinese chemical industries on a scale never before known. But, as a result of the devastation, China will be less able to finance this program on such a vast scale. Literally thousands of commodities will have to be produced to meet the needs of the enormous population. In this development she will need outside help in financing, in technical skill, and in management. Among the United Nations, probably no nation today is better situated than the United States of America to perform such work for the following reasons:

First, the United States enjoys a unique position of trust and good-will with the Chinese people who appreciate the in-

tegrity and clean record of American businessmen and engineers. Their interests are purely commercial, therefore they have no political designs on China. The traditional friendship existing between the two nations, built partly on the magnanimity and far-sightedness of the American leaders and partly on the genuine appreciation and spontaneous urge for reciprocation on the part of the Chinese people, is something that only those who have visited China can realize. This is indeed a veritable "reservoir of good-will," to borrow an expression of the late Wendell L. Willkie.

American trade with China has been slow to develop, probably because of the distances involved, and yet in 1937, just as the war in China broke out, customs returns showed that the United States had reached second place among the nations participating in China's foreign trade. The significance of this should not be passed over too lightly.

Second, China, like the United States, is a large country endowed with great natural resources which have to be developed for the benefit of her people. What has been accomplished in America in the short span of her history will provide valuable experience as a guide for a comparable development in postwar China. The planning on an adequate scale, the long-term view in the ultimate return for future generations, and the broad vision of the cultural and material benefits to be derived from the undertaking, which have characterized the American industrial development, all afford an exemplary parallelism by which China may well profit. Furthermore, American methods, technological efficiency, and mass production are especially suited to the needs of a large country and population such as China's.

China Offers Good Market

Third, the United States, with her vast production capacity, resulting in overproduction even during the war time, will inevitably face some slowdown. Her factories will then find the overseas market a good outlet for her surplus goods to keep her home labor employed and the wheels turning in her industrial plants. China, with her vast population, is a good market.

America is bound to become more and more export-minded. Her export, although small in size at present, will grow rapidly and will eventually become a factor in producing the marginal goods (or "increment-cost" goods as the economist will say), for export to the Far East to help keep her industries in full production. The Germans used to warn their people that they "must export or die." The United States, even with her vast domestic business, will soon find—if she has not already found—that her export trade, too, is a *sine qua non* for the adjustment of her domestic industries. American trade with China is just beginning. The industrial development in China will rapidly raise her standard of living and provide her with greater capacity to purchase and to absorb American goods, and with greater variety and refinement in the commodities required by her people.

Fourth, at the close of this war many defense plants in the United States will have to be closed and surplus equipment disposed of. Such surplus and idle equipment can be profitably turned into productive implements as a part of the American contribution to the development of chemical industries in China. Even the industrial skill, which upon the return of the service men from overseas, will face a scarcity of opportunities for employment at home, will find an outlet for employment abroad. For instance, it can be easily conceived that there will be a great demand for American foremen, skilled artisans, mechanics and electricians, and experienced engineers of diverse professions, to help supervise the new chemical industries in China. For, indeed, services and know-how are as essential to the success of the undertaking as the materials, equipment, or machinery in the operation of a chemical industry.

Fifth, the stage is already set for the United States to participate in the reconstruction and development in China. The way has been prepared by the far-sighted Lend-Lease instrument which, in the peace that follows, will provide purposeful activities for the Foreign Economic Administration, one of the main functions of which is to arrange for financial and technical assistance in the promotion of trade, industries, and the general economic intercourse between the U. S. and the world.

Finally, for America's own sake, if the United States is to play an important role in the family of nations after the war, she has to be prepared to render effective aid to a friendly nation occupying such an important position across the Pacific. Inasmuch as the United States has been a champion to defend democracy, she cannot escape the responsibility, in her own interest, and for her own protection, to help maintain those ways of democracy after the victory is won. Such assistance in the development of the chemical industries for a friendly and peaceful nation like China will be most instrumental in providing lasting cooperation among the major democracies in building a bulwark against future enemies of democracies. This is an effective way of preventing the cyclic recurrence of the wars that have plagued mankind every 20 or 25 years.

BRAZIL

JAYME STA. ROSA *as chemical consultant and editor of Revista de Quimica Industrial has for many years taken a leading role in the Brazilian chemical industry. He is well qualified to present a picture of what that country expects from the United States of America in chemicals, chemical engineering equipment and the know-how for the industrialization expansion in which Brazil is now engaged.*

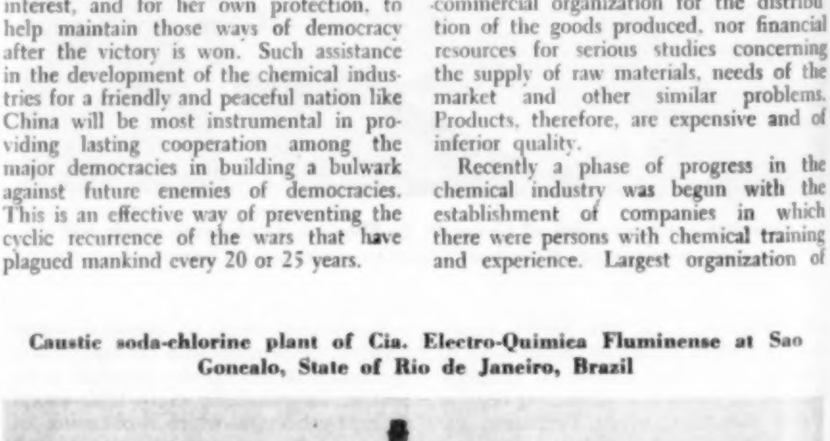
PRINCIPAL factors, for the lack of development in the Brazilian chemical industry, are the absence of a comprehensive outlook, a chemical tradition and accumulated experience such as exists, for example, in the sugar and textile industries. In general, those who enter upon the manufacture of chemicals are ex-businessmen, bankers and speculators of diverse types. The prospect of easy profits is the lure. But such persons cannot succeed because they do not know a specialized field.

The second reason to explain the lack of growth is to be found in the tendency to produce on a small scale, in the nature of a trial. Besides this, no consideration has been given to the plan of grouping various industries which would be complementary one to another.

Since the business is carried on on a small scale, there is not much margin for adequate technical assistance and the development of technological research. It is likewise not possible to have a good commercial organization for the distribution of the goods produced, nor financial resources for serious studies concerning the supply of raw materials, needs of the market and other similar problems. Products, therefore, are expensive and of inferior quality.

Recently a phase of progress in the chemical industry was begun with the establishment of companies in which there were persons with chemical training and experience. Largest organization of

Caustic soda-chlorine plant of Cia. Electro-Quimica Fluminense at Sao Goncalo, State of Rio de Janeiro, Brazil



this type, well directed technically, is the Cia. Quimica Rhodia Brasileria, with factories in Santo André near the capital of São Paulo. It manufactures acetic acid, acetic anhydride and acetone in large quantities, starting with ethyl alcohol. It also produces cellulose acetate, inorganic acids and a whole series of chemicals.

Another company that has contributed toward the improvement of the Brazilian chemical industry is the Indústrias Químicas Brasileiras "Duperial" S.A. (a Brazilian merger of the E. I. du Pont de Nemours & Co., Inc., and Imperial Chemical Industries Ltd.), which has industrial establishments in the country, has for years been studying a project for setting up a large plant for the manufacture of Solvay soda at a point not yet selected and which is soon to build a factory in São Paulo for the manufacture of caustic soda by electrolysis.

A few months ago in Bahia there was inaugurated a factory for the production of theobromine and caffeine, from cacao, by the Brazilian company affiliated with Monsanto Chemical Co. We hope that this factory will be the nucleus from which other undertakings will irradiate with the support of Monsanto.

We have in Brazil, in addition to various small iron and steel mills, an aluminum plant set up but not yet in production, and two planned projects; tiny nickel, tin and lead plants, which, even as experiments, should be considered precarious undertakings; Portland cement plants, sufficient for our present requirements; factories producing refractory materials and chemical stoneware.

Possibilities exist for the creation of large centers of chemical industries but three essentials are needed to carry out the projects: technical assistance of specialized chemical engineers; modern, efficient installations; and a commercial organization capable of distributing the products to innumerable consumer factories, both those already in existence and those that will appear as soon as they find a propitious atmosphere. One of these centers could be located, for example, in the vicinity of the Paulo Afonso Waterfall, in the State of Alagoas, and would have as its object the exploitation of electrochemical industries. Another could be set up in the South, based on a large sulphuric acid plant utilizing pyrites.

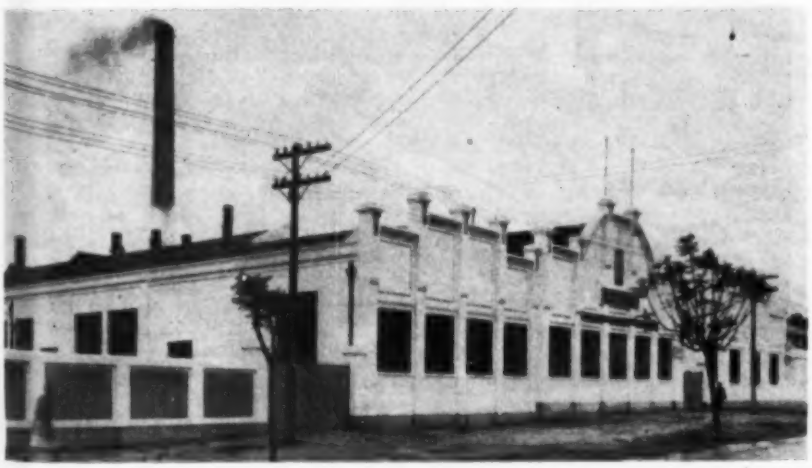
These are Brazil's problems. Many believe that the United States would find it advantageous to cooperate in the development of the Brazilian chemical industry because, with a developed chemical industry, the Brazilian market would become a substantial consumer. Besides this, we could buy in larger quantities pretroleum products, metals, machines, railroad equipment, automobiles, trucks, planes, apparatus for home comfort (such as radios, refrigerators and air-conditioning units), pharmaceutical specialties, articles of personal use and an infinite number of articles of luxury or utility.

How can the United States cooperate? Especially from the point of view of technical assistance. American chemical engineers, specialists in certain types of production, would be called to render their aid. To them a vast field of activities in Brazil is open.

Theirs would be the task of organizing complete plans for industrial installations; of cooperating with our mechanical engineers in the construction of machines and equipment; of superintending the assembling of chemical plants; of aiding in the preparation of specialized Brazilian technicians and workmen; of putting the installations in operation; of studying questions of raw materials, byproducts and wastes; of finding means to lower production costs; of solving economic problems related with fuels and electric power.

In many cases we would appreciate receiving complete installations constructed in the United States. The work in Brazil would be to assemble them and put them in operation, the assistance of chemical engineers familiar with machinery and its operation being indispensable.

In São Paulo and Rio de Janeiro there are a few mechanical plants that have built various chemical installations. The "codiq" (Construtora de Destilarias e Instalações Químicas S. A.) of São Paulo is capable of building distilleries for anhydrous alcohol, installations for ethyl alcohol, vacuum apparatus, autoclaves, solvent extraction plants, evaporators, and many other kinds of process equipment. The "Máquinas Piratininga S. A.," of São Paulo, also plans and builds chemical installations and equipment. Other plants also can build machines, apparatus and equipment for the chemical industry, on order. The "S. A. Indústrias Reunidas F. Matarazzo," the largest industrial organization of Brazil and one of the largest in the chemical field, has built its chemical installations (for the production of viscose rayon, transparent paper similar to cellophane, sulphuric acid and other products) in its own plants.



A caffein extraction plant of the Industria Organoquinimaca, Ltda. Brazil has numerous corparatively small chemical manufacturing plants.

Brazil Builds Its Own

In Rio de Janeiro there are, among others ,the "Skoda Brasileira S. A." and the "Cia. Matalúrgica e Construtora S. A.," which make installations for chemical industries. Outside of São Paulo and Rio de Janeiro there are plants capable of this same type of construction. In a small city of the State of Rio Grande do Sul, Carasinho, there is a plant, directed by the engineer Joã Marek, which makes machines and apparatus for the chemical industry, especially semi-continuous retorts for the destructive distillation of wood.

It should be noted that in general orders for chemical installations can be placed in Brazil. It is necessary that either designs or models of the machines be available, as well as the rights on the use of the patent, when such is the case. It is further noted that the cost of construction in Brazil is relatively low.

With respect to the cooperation that we could give to the United States, we should mention the possibility of exporting certain raw materials and a few products. In the group of minerals, we could export manganese ore, tungsten (scheelite), columbite and tantalite, zirconium, beryl, monazite sand, quartz, and barite.

In the class of processed products, we could send such oils as babassu, castor, oiticica and perhaps tung (the cultivation of which is being undertaken), essential oils such as linalool, orange, peppermint and sassafras, ethyl alcohol, manioc starch, possibly caffeine, preserves from tropical fruits, concentrated fruit juices (if this technique progresses), fine cotton textiles, silk and fine leather goods.

We cannot supply crude rubber. The work of getting latex from wild trees does not sufficiently compensate the worker. Therefore the amount available is small. If the use of natural rubber together with synthetic rubber continues to be absolutely indispensable, perhaps those interested may do as Ford did, lay out rubber plantations. But we can supply waxes, from carnaúba, licuri (or ouricuri) and beeswax. Americans might also find of interest wax from sugar cane. A plant for this product is being set up in the

State of Rio de Janeiro, with an initial capacity of five metric tons per day.

For the development of trade between Brazil and the United States, on a firm and durable basis, it is advisable that there be a readjustment in business methods, mutual comprehension of the psychological nature of the two peoples and the abolition of business practices that artificially affect the rise and fall of current prices.

NETHERLANDS

A. ROOSEBOOM and **G. BOSSCHIETER,** *respectively vice chairman of the Netherlands Study Group for postwar construction and advisor to the Netherlands Economic Mission, have been for some time concerned with plans for postwar rehabilitation of that country. Mr. Rooseboom also is vice president of R. W. Greeff & Co., New York.*

The Netherland's international orientation has determined largely the development of its chemical industry. The very limited supply of domestic raw materials (coal and salt) has emphasized the establishing of export industries on the basis of imported raw materials.

Most important chemical industry from a production standpoint is the fertilizer industry. Both nitrogenous and phosphatic fertilizers have been exported in large volume and the Dutch superphosphate export was in prewar years among the largest in the world notwithstanding the fact that all the crude phosphate had to be imported. The heavy chemicals industry is not sufficient to cover domestic requirements, but production facilities were considerably expanded during the thirties. The large Dutch oilseed crushing industry made possible the development of a very considerable soap, margarine and candle industry. Another example of an export industry dependent on foreign raw materials is the important rayon industry. Holland also was a paint exporting country and its linseed oil products are widely known. In the pharmaceutical field mainly specialties were produced domestically (quinine derivatives, hormones, insulin, vitamins, etc.) and a great part of the consumption had to be covered by imports. Dutch agriculture provided further for a starch and alcohol industry. The overseas territories of the Kingdom supplied raw materials for tin smelting, essential oil, rubber products and many other industries.

The volume of chemical and pharmaceutical trade between the Netherlands and the U. S. A. before the war was never very sizable. Exports of chemicals and pharmaceuticals produced in Holland to the U. S. A. amounted to some 3 million dollars in 1938 and exports from the U. S. A. to Holland about equalled this figure. This leaves out the transit trade in Holland which would about double this figure. Among the most important products imported here before the war from Holland were according to value: ammonium sulphate, creosote oil, quinine sulphate, lithopone, other fertilizer materials and glycerine. Moreover, sodium cyanides, napthalene and various chemical specialties were of some importance. Important export items to Holland were: borax, crude phosphate, carbon black naval stores and a large variety of synthetic organic products such as coal tar dyes, pharmaceuticals, acetone, etc., but none of these in any great quantity.

The large textile industry in Holland required a considerable amount of synthetic dyes of which only some 15 percent were produced domestically. Imports of synthetic dyes amounted in value to about 6,600,000 guilders (appr. 3.5 million dollars) in 1938, of which roughly 65 percent came from Germany. Chemical trade between Germany and the Netherlands was very much larger (especially imports in Holland) than the trade between the U. S. A. and Holland, which of course is not surprising in view of the proximity and important position of the German chemical industry in Europe.

As to the present status of the Netherlands chemical industry very little can be said due to the fact that only the southern part of Holland is liberated. Still in German hands are most of the sulphuric acid plants, the nitrogen fixation plant near the blast furnaces at Ymuiden, the largest Dutch rayon plant, the important sodium salt industry and many smaller chemical industries. It is known that most of the chamber acid plants have been stripped of lead. The decrease in nitrogenous fertilizer production since the occupation was largely caused by dismantling of the important nitrogen fixation plant at Sluiskil. Rayon production has been stepped up considerably and the same holds for the salt production. On the other hand production of hydrochloric acid by way of the salt cake process has been stopped because no more acid was needed for the large Dutch tin smelter. The production of pharmaceutical specialties has been strongly reduced due to lack of raw materials like glands, etc., and the need for pharmaceuticals in general is most urgent.

After the war when more or less normal trade becomes possible again, it is to be expected that due to change in conditions resulting from the war, the volume and nature of the chemical trade with the Netherlands will have quite a different aspect.

It is certainly to be expected that because of military or political restrictions, confiscation of patents, etc., the dominant position of Germany as chemical supplier will be reduced to a much lower level. This should definitely open possibilities for American chemical manufacturers to obtain a larger share in the import of chemicals in the Netherlands, especially of synthetic organic chemicals such as dyes, pharmaceuticals, synthetic resins, photographic chemicals, insecticides, etc. On the other hand, it may be expected that after the war there will be no need here for importing such products as ammonium sulphate, the production capacity of which has been greatly increased during the war.

Since the Netherlands is a highly industrial country with ample educational facilities for chemical training (Dutch chemists and chemical engineers always enjoyed a good international reputation and have been employed all over the world) it is to be expected that after the war chemical manufacturing in Holland will be further expanded. In fact, even during the German occupation some new plants have been put in operation, for instance the manufacturing of cyanamide which, before the war, was not produced in Holland. As there always was a considerable production of crude coal tar products (benzol, toluol, creosote oil, etc.) in the Netherlands, there is a possibility that the present small dyestuff production

In foreground is a Netherlands plant for production of ammonium sulphate and ammonium nitrate. In background are the steel works

will be extended, and that other synthetic chemicals will be manufactured from coal tar, which would fit in with a general policy of decentralization of the chemical industry in Germany.

Undoubtedly there will be opportunities for American chemical manufacturers to participate in the establishment of new production facilities in Holland. Such participation may take the form of stock interest or of supply of know-how, by licensing or otherwise; several alternatives are potentially possible. Establishment of new industries with export potentials will probably be encouraged so as to improve the trade balance of the country. In this connection consideration should be given to the fact that the Netherlands always had well established trade relations with the Far East and will continue to cultivate these relations after the war.

Although it can be expected that for the reconstruction and extension program of the Dutch chemical industry equipment will be manufactured as much as possible by local engineering firms, there will be considerable opportunities for American equipment manufacturers, in particular for special kinds of equipment such as high pressure vessels and pumps, stainless steel equipment, control instruments, etc.

When studying economic possibilities in the Netherlands, it should be borne in mind that there are strong indications that close economic cooperation between Holland and Belgium will be established after the war. Such cooperation might well result in a custom union of the two countries (and Luxemburg) which would mean that domestic markets for industries in these countries will be doubled. (Total population is close to 20 million.) Moreover it may be expected that a certain coordination between the two countries with respect to the reconstruction program will take place in order to avoid wasteful competition.

For such American manufacturers who wish to establish representative offices somewhere on the continent of Europe for managing their trade or manufacturing interests in the continental countries, Holland will offer very attractive possibilities. Well situated for international freight and passenger traffic either by sea, rail or plane, it will have available ample personnel, technical or otherwise. By and large, Hollanders have an excellent knowledge of the main European languages and their business education, experience and technical skill is of the highest standard. Banking facilities in the Netherlands have always been well known for efficient services and expert handling of accounts. This is a point of great importance because of probable exchange restrictions which will require expert guidance and advice to the businessman. Corporation laws and taxes were quite liberal, and it may be expected that these conditions will be re-established after the war.

No attempt is made in this brief statement to discuss other than the European part of the Netherlands Kingdom.

SWEDEN

EDWIN C. JAHN *is professor of forest chemistry in the department of pulp and paper manufacture at N. Y. State College of Forestry, Syracuse University. Dr. Jahn returned recently after nearly a year in Sweden where he made an investigation of the forest products industries for U. S. Department of Agriculture and American industries.*

SWEDEN'S economy and well being are dependent upon world trade. In prewar days Sweden exported great quantities of raw, semi-finished and finished products, such as iron ore, high-grade steel, wood pulp, lumber, and paper. In return she imported foodstuffs, machinery, commercial steel, coal, petroleum products, sulphur, chemicals, leather, rubber, textile raw materials, automobiles and other goods. The Swedish people have a high standard of living and good purchasing power, and have maintained an active world trade much greater than their population of six and a half million would indicate. Furthermore, industrial activity, private consumption and real national income increased considerably in the decade prior to the war.

The isolation forced upon Sweden by the war caused readjustment of her industry. Her large export industries lost about three-fourths of their markets. Simultaneously the necessity of producing many goods formerly imported led to a program of self-sufficiency, carried out in the face of rearmament and labor shortages in many fields due to mobilization. Some of the new products and processes developed will have permanent value, but most are temporary expedients and will disappear when imported products become available.

Since wood is the principal raw material, many of the new emergency products are based on the forest. They include prefabricated building units, laminated paper-plastics articles, wood distillation products, and products derived from pulp and pulp byproducts. About 80 percent of Sweden's soap is made from tall oil, a byproduct of the sulphate pulp industry. High grade rosin for the paper industry, sulphonated oils, cable insulating oil and numerous minor products are also produced from tall oil. Ethyl alcohol, made by the fermentation of the waste liquor of the sulphite pulp industry, is used not only for drinking spirits and motor fuel, but also by chemical industry for making glycol, glycol derivatives, butanol, esters, polyvinylacetate and other organic chemicals.

The shortage of gasoline and petroleum has necessitated the development of lubricating oils and diesel motor fuels from wood and stump tars and has brought about the expansion of charcoal manufacture. About 75,000 cars, trucks and buses are driven by producer gas generated by burning charcoal or wood.

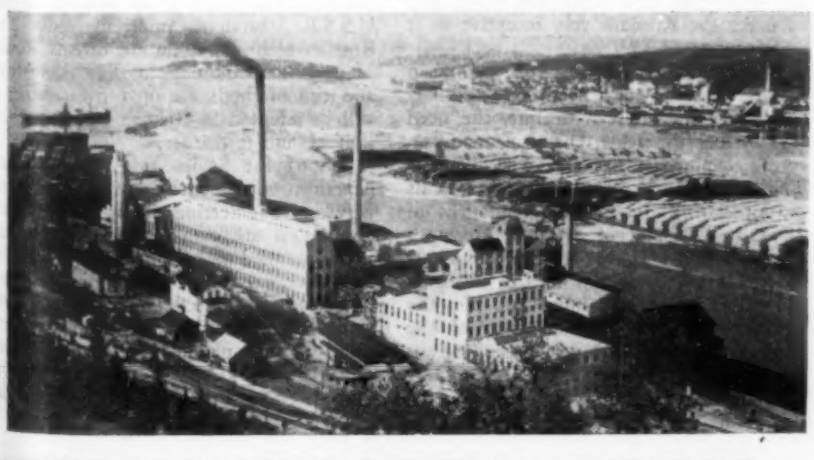
Besides the organic compounds based on wood, small developments have taken place in other organics, especially pharmaceuticals. Products based on wood pulp include staple fiber, rayon, nitrocellulose explosives and lacquers, and cellulose ethers for lacquers and adhesives. Furfural is made in fair quantity from tannin extracted oak chips.

The shortage of phenolics is counterbalanced in the plastics field by the production of carbamide and melamine resins. Pyrite sulphur production has greatly increased and now covers current domestic needs. Sulphur dust is also collected from the flues of smelters. The surphuric acid, nitrogen fixation and superphosphate industries have considerably expanded. A small shale oil industry has been developed which, however, has an annual capacity of only about 5 percent of the amount of petroleum imported in 1939, which was nearly 1.5 million metric tons.

Due to the shortage of imported fuel, there has been a large expansion in the development of hydroelectric power. Between 1941 and 1944 the energy produced expanded 9,300,000,000 kwh. to 12,500,000,000 kwh. During 1944 there was a record expansion of 15 percent.

The effect of the war on the large

Sweden is ready to resume trade with the U. S. A. as soon as the war ends. Chemical pulp available for shipment is estimated at 700,000 tons



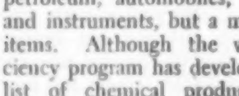
Swedish export industries has been drastic. The only large important Swedish chemical export product is pulp. The annual capacity of the chemical pulp industry is about 1.5 million metric tons of sulphite and 1 million metric tons of sulphate pulp, not including pulp made for direct conversion to paper at the mills. Prewar deliveries of this pulp based on the 1936-1939 figures were:

Domestic	3%
Europe, excluding Great Britain	27%
Great Britain	18%
U. S. A.	42%
Other transatlantic markets	10%

Pulp production declined to about 35 percent capacity by the end of 1943 and has further deteriorated during the past year. The principal trend in the Swedish pulp industry has been in the field of bleached pulps. With an eye to postwar markets much thought has been given higher pulp qualities and new special pulps. Bleached sulphate capacity has increased about 2.5 times. Viscose pulp capacity is about 500,000 metric tons. It should be emphasized that the total pulp capacity has not been increased, but that the industry has become more versatile and flexible.

The Swedish export industries are ready to resume trade with the U. S. A. as soon as the Nazi war ends. The pulp industry, for example, has its storage capacity filled and is now storing pulp on boats. The total chemical pulp available for shipment is now estimated at nearly 700,000 metric tons. The wood raw material condition is also good.

When the war ends Sweden will again want many American products, not only petroleum, automobiles, tires, machinery, and instruments, but a multitude of other items. Although the wartime self-sufficiency program has developed an imposing list of chemical products produced in Sweden, most of them are of temporary expediency and small in capacity. Sweden will again import much of her chemical requirements. Lack of equipment has hampered many Swedish chemical industries during the war, and Sweden will turn to the U. S. A. for industrial engineering equipment and also for chemical equipment and instruments which are now exceedingly difficult to obtain.



RUSSIA

J. G. TOLPIN *is a native of Russia. He is a graduate chemical engineer from the University of Kiev and Columbia University, and spent two years doing graduate work at the University of Jena, Germany. For the past 15 years, Mr. Tolpin has continuously followed the Russian scientific literature for Universal Oil Products Co., Chicago, where he is editor of Survey of Foreign Petroleum Literature.*

POSTWAR trade with the U.S.S.R. in the chemical field cannot be correctly estimated on the basis of past experience alone. This is especially true with respect to the types of goods, and particularly the services in the chemical field, which the Russians will require of our industry and our technology. A more correct appraisal may be achieved by studying the Russian industrial and economic factors bearing on each product or type of technical service.

"To reach and surpass in production the most advanced capitalist countries" remains the goal of the Soviet planned economy. Execution of "The Chemical Five-Year Plan," was interrupted by the war, but restoration of the areas reconquered from the Germans is going on according to newly evolved plans, and these call for wide improvements in the industries which are being rebuilt.

Soviet foreign trade has always been geared to the above-mentioned goal. In addition, the 190 to 200 million population of the Soviet Union constitutes a single customer as far as the outside world is concerned, by virtue of the monopoly of foreign trade. The Soviet Union imports and exports commodities which are considered necessary or worthwhile in connection with the country-wide plans. Selling to the Soviet Union must be based primarily on a study of its plans, and not on the conventional approach obtaining with respect to other countries, such as the attitude of the individual consumers in the buying countries, advertising, etc.

Potential Market

The potential market for United States industry which the Soviet Union presents, and which is variously estimated to amount to from 100 million to 2 billion dollars a year in the first few years after the end of the war, must be nourished by making a definite place in our imports program for some of the goods which Russia can export. Manganese may serve as a good example. Other natural resources of Russia, especially those recently explored under the stress of war, may also be taken into account. Numerous alkaloids have been isolated from various plants. A new variety of tobacco which is immune to mosaic virus was described in 1942.

The prerequisite to American trade in goods and services exists in the U.S.S.R. as expressed in recent utterances of Russian leaders and economic experts and in the reaffirmation of patent rights of foreigners in the Soviet patent law of 1941. The experience with American technical aid has in the past been sufficiently satisfactory to make the Russians very receptive to it in the future.

As the reconstruction of European Russia proceeds, the need for manufactured commodities will decline, the need for services to create chemical manufacturing facilities in Russia will increase. The Soviet chemical industry increased its output during the first eight months of 1944 by 12.1 percent over that during a similar period of 1943, and improvements especially noted pertain to the nitrogen, soda, and aniline dye industries. On the occasion of the first anniversary of the reconquest of the Donets basin it was stated in the Russian press that up to 1,000 manufacturing establishments resumed operations during that year, including 42 batteries of coke ovens. We may thus expect a drop in the Russian demand for coal-tar derivatives. However, the total volume of chemicals needed will not appreciably decrease. Reconstruction and operation of the rehabilitated plants require numerous chemicals, some of which were scarcely produced in Russia before the war; for some chemicals there is insufficient manufacturing capacity or labor. In principle, the Soviet economic policy does not tolerate extensive imports of any manufactured goods, and throughout the technical literature for the past 20 yr. are to be found researches aimed at substitution of imported chemicals. Nonetheless, no matter how desirable it may appear from the point of view of self-sufficiency of the Soviet state to produce these chemicals, they will buy them now.

Satisfying to a certain degree the hunger of the population of postwar Russia for consumers' goods may become a necessity, and the chemicals and equipment needed for this purpose will have to be procured if they cannot be produced at home in sufficient quantities. This will include chemicals for the rubber, leather tanning industries, pharmaceuticals, solvents and plastics. The numerous new products of our wartime industrial developments, of which the Russians produce no equivalents although some of them are being carefully studied, will certainly be bought in amounts in which we are able to supply them.

The trade policy of the government with respect to American technical aid to their industries is very different from that guiding their attitude in purchasing chemicals. Our methods of large scale production and new equipment developed for this purpose will remain of interest to the Soviet chemical industry for a long time to come.

Adapts Our Methods

There is a desire in the Soviet Union to get away from consuming fermentation alcohol for butadiene production, and one of the methods considered in which the American petroleum industry may be helpful is catalytic dehydrogenation of butane and butenes. The American processes employed in manufacture of high-octane gasoline, such as catalytic cracking and isomerization, attract just as much attention as did thermal cracking and catalytic polymerization before this war; catalytic cracking was recently introduced in the U.S.S.R. through American aid. The Russian technical literature reveals studies in progress pertaining to these industries, and the methods acquired from America will be adapted to Russian conditions, resources, and researches.

Among the Soviet industries in which American equipment and American chemistry and engineering may find important application are manufacture of chemicals from petroleum, of phenol and vinylite resins, nylon, optical glass and glass fibers, hydration of ethylene and other olefins, cement and heavy chemicals. All these industries are planned, studied or developed in the U.S.S.R.—they must have been given a high rating in the government plans.

RUSSIA

ERNEST C. ROPES *is chief of the Russian Unit, Bureau of Foreign and Domestic Commerce. He was educated at St. Petersburg, Russia, and at Columbia University. From 1919 to 1922 Mr. Ropes was in North Russia and Estonia. The following year he entered the bureau and in 1925 became Russian specialist in which capacity he has continued except for occasional trips to Russia.*

Like all Soviet industries, even those producing consumer goods, the chemical industry for the past four years, and perhaps longer, has been concentrating all its efforts on manufacturing war materials, assigning to civilian consumption only such quantities of fertilizers, for example, as were necessary to keep cotton and other farms producing at the maximum rate, or of dyestuffs to enable the textile industry to supply army requirements. While the third five-year-plan, running from 1938 to 1942, was announced in 1939 as including special appropriations for the expansion and multiplication of chemical plants, particularly those turning out certain products new to Russia, such as superphosphates, nitrates, and potash salts, the record of performance of these and other plants has not been reported since 1938, and as the accompanying table indicates, only a few items were shown then.

Yet the table does imply rapid and great progress, and even the little information released during the war years serves to prove that the plans made were not only carried out in the main, but were exceeded. In the first place, a number of chemical plants in western European U.S.S.R. were evacuated bodily and transferred to the Urals or beyond. In many cases they were nearer to raw materials there, and quickly resumed production of chemicals for war.

There has also been a considerable amount of construction of new plants, in the East, since 1941. The number is given as 13, and 15 plants already there were enlarged, resulting in an over-all increase of production by 250 percent. Attention was concentrated on the potash mines in the Northern Urals, at Solikamsk; the soda plants at Usolye; and the pyrites plants in the Urals. Recent information indicates that the Kara Tau phosphorite deposits in the Tian Shan mountains in Kazakhstan, known for seven years but previously not worked, have been subjected to intensive development, and that a fertilizer plant will start operations early in 1945. These mines will supply the Central Asian cotton and sugar beet fields with phosphate fertilizers, which formerly came from Khibiny on the Kola Peninsula, 5,000 kilometers away. The latter plant, shut down for some time because of war movements, has now resumed production and will ship to the Ukraine and to foreign markets. It uses ores from the mountains of apatite in that district.

Output of Soviet Chemical Industry

(Thousands of Metric Tons)

	1913	1929	1933	1938
Total output, by value at 1926/27 prices, million rubles	457	645	2,301	3,809
Soda ash	160	231	325	532
Superphosphate, from ore	63	204	690	1,571
Pyrites	76	301	415	978
Aniline dyestuffs	4.3	13.3	15.9	35.3

The importance of fertilizers in Soviet agriculture was recognized long ago and a special research institute was set up under the Academy of Science. The Academy has since been divided up in a series of institutes, each covering a special field of study. In addition to fertilizers, studies include insecticides and fungicides, and the special uses of the phosphates, potash salts, and borates found in abundance in various parts of the U.S.S.R.

New plants described in the recent Moscow press include one in the Caucasus to process newly discovered deposits of arsenic; a new ammonia plant at Tashkent, producing 80 metric tons of ammonia daily, some part of which is used for nitrate fertilizers; and four new hydrolysis plants in the East, producing alcohol from sawdust. These last have an annual capacity of 8,000,000 liters which is to be raised to 20,000,000.

Ukraine Plants Restored

This skeleton picture would not be complete without at least mention of the plants that were destroyed during the German occupation of the Ukraine but which have now been restored to activity. Among these are a nitrate fertilizer plant in the Donets Basin in southern Ukraine; one section of a coke-chemical plant at Konstantinovka in the same district; a soda plant in the Voroshilovgrad oblast, now turning out 230 tons daily; and two hydrolysis plants, at Leningrad and Stalingrad, which, besides alcohol, also make edible yeasts and other products from wood.

The intensive efforts suggested by the above brief record have evidently continued during the war, for the year 1943 showed an over-all increase in output of basic chemicals of 39.5 percent in the fourth quarter over the record for the first quarter. Emphasis was placed on nitrate products, such as ammonia, nictric acid, and combinations of ammonia with sodium and potassium; and on soda products, dyestuffs, organic chemicals, sulphuric acid, and plastics. These are chiefly military chemicals, of which the supply has been increased by imports from the United States under Lend-Lease. But it may be safely assumed that the war, while forcing the Soviet authorities to concentrate on chemicals for explosives and other war purposes, will not change the plans to develop in the U.S.S.R. a modern, many-branched chemical industry such as was outlined in the plan. New products to be added eventually to those now turned out include many varieties of plastics, new paints and varnishes, products obtained from complete recovery of valuable chemical byproducts from coke-oven, petroleum and natural gases, a number of synthetic chemical products such as ammonia and textile fibers, and several kinds of synthetic rubber.

It is of interest that the equipment for the new industries and for the reconstruction of the plants destroyed by the enemy, was manufactured in the Soviet Union, with the exception perhaps of some American materials supplied on Lend-Lease.

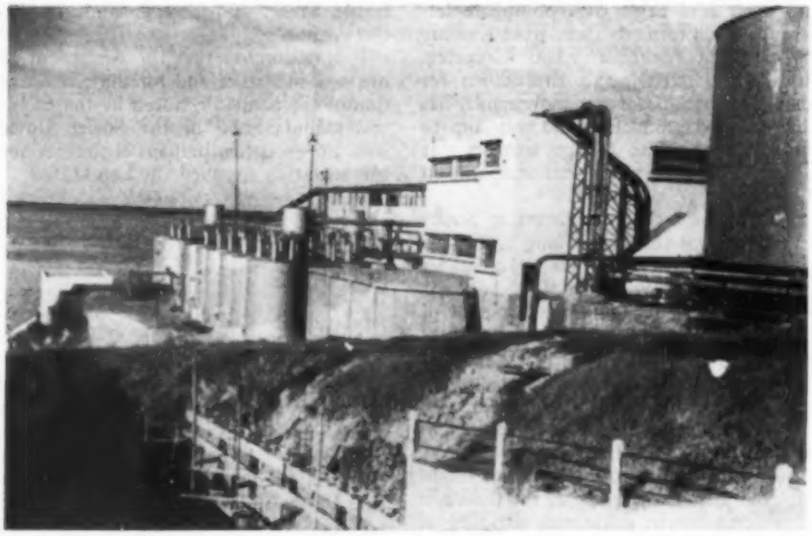
TURKEY

Turkey offers interesting postwar possibilities as a market for chemicals and allied products as well as chemical plant equipment. Although the demand for chemical products up to the outbreak of the European war was relatively small, consumption was showing an appreciable increase, chiefly because of the rapidly growing requirements of the newly established government-sponsored industries but partly also to keep pace with the natural expansion of the needs of a country still predominantly agricultural in character.

Industrial development in Turkey is of relatively recent origin. It actually began in 1934, when the first of two five-year industrialization plans was started. This program, incidentally, was initiated only after a long period of government planning, designed to make the country self-sufficient in many products for which it had been dependent on imports, and also to utilize more effectively some of the extensive domestic raw materials. The first five-year plan contemplated factories for the production of textiles, paper, glass, flour, cement, and soap, as well as olive oil presses and refineries, canning plants, and sugar refineries. Most of these projects were completed, but the European war interrupted progress on the second plan which provided for a steel plant, chemical, food preservation and processing industries, power plants, mineral development, and a merchant marine.

Projects Finished

Of the projects finished under the second plan, special mention might be made of the steel plant at Karabuk, which started operating in 1940. It is considered somewhat of a milestone in Turkish industrial progress, and is regarded as the nucleus of a much larger iron and steel project. The country's first heavy chemical plant, producing sulphuric acid and superphosphates, was also constructed at Karabuk. Other plants located elsewhere and completed before or since the war include a chlorine and caustic soda plant, a semi-coke plant, a cellulose plant, and a paper factory. Immediate plans call for the early construction of a factory to produce chemicals for the tanning industry. Synthetic gasoline and synthetic nitrogen plants were also scheduled, but these were postponed because of lack of equipment. Despite the degree of industrial progress realized under these two "plans," Turkey is still dependent, and will be for some



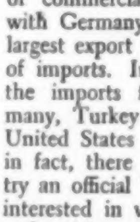
Filtration plant for the Parana River water at a pulp and paper mill in Argentina. The process industries are comparatively young

time, on imports for a substantial part of its manufactured requirements.

During the period of industrial expansion Turkey's imports of chemicals and allied products rose to $5,000,000 in 1938 from $2,700,000 in 1934, while the imports of coal tar dyes, which are not included in the preceding figures, increased to $1,513,000 from $570,000. Germany supplied the bulk of these products, as the negligible local output is confined to small quantities of benzol, napthalene, road tar, toluene, sulphate of ammonia, and processing or packaging of the simpler types of pharmaceuticals.

The industrial program in Turkey is primarily a government undertaking and has been financed by officially controlled institutions. Payment for the machinery and engineering skill required from abroad has usually been by exports of Turkish products, due to the constant scarcity of foreign exchange. For example, the important Karabuk steel plant, constructed by a British firm, was paid for largely by chrome exports, and much of the equipment for the chemical plants was obtained from Germany under a compensation agreement. Since merchandise exports represent practically the only important source of national income, it is likely that Turkey will have to depend heavily on this form of payment for its future industrial requirements. In the past Turkey's exports to the United States have consisted chiefly of leaf tobacco (about 70 percent of total value of exports to this country), chrome ore, copper ingots, valonia, hides and skins, filberts, dried figs, sausage casings, licorice root and wool. These are among Turkey's leading export items, which also include mohair, raw cotton, coal, olive oil, raisins, opium, sheep, goats, cattle and miscellaneous agricultural products.

The need of new outlets for its exports has recently become Turkey's most urgent problem, and its solution may be an influential factor in determining the source of supply of its future industrial requirements. Already curtailed by war time difficulties, this trade was sharply reduced by the severance in August, 1944, of commercial and diplomatic relations with Germany, which has been Turkey's largest export market and principal source of imports. In order to replace some of the imports formerly supplied by Germany, Turkey has already turned to the United States and other United Nations; in fact, there is at present in this country an official Turkish purchasing mission interested in various industrial machinery and mining equipment. While Turkey may be in a position to finance some of its immediate requirements with foreign exchange, the continuance of such purchases will depend on its ability to market its export products.



ARGENTINA

GERALD J. DOUGHERTY *was born in the United States but is now director of* Comments, *official publication of the U. S. Chamber of Commerce in Argentina. He and his associates in the Chamber are primarily concerned with the relations of the two countries, particularly their postwar trade.*

ARGENTINA, traditionally agricultural and pastoral, has undergone a radical change during the past war years. During 1943, for the first time, value created by industrial processing exceeded the combined values created by agriculture and cattle breeding, $675 million and $650 million, respectively.

Implications of the present wartime industrial boom should not be over estimated, however. In sizing up postwar possibilities, it might be wise to consider the present trend of government thinking. Vice-President Perón in a recent address said, "The government is carefully studying the question of postwar Argentine industrial production and national consumption; to safeguard the Argentine economy, which may lose half its export market to competitors after the war, it is necessary to increase wages, thus making possible increased national consumption."

The Argentine chemical industry does not rank with such leaders as food and textiles. Comparatively young, the industry, during the period 1935–1940, increased the value of its manufactured products some 60 percent, reaching a total value of $54 million in 1940.

The chemical industry, as of 1941, accounted for only 3.8 percent of the individual establishments, employed 3.3 percent of the nation's industrial workers, demanded 4.4 percent (value) of the fuels, lubricants and electrical energy consumed in manufacturing, utilized 5.3 percent (value) of the industrially consumed raw materials (65.4 percent of which were of national origin, 34.6 percent imported), and produced 4.7 percent (value) of the nation's industrial products. Importations of chemical products during the same period were valued at $23.4 million (tariff values); exports, $6.2 million.

The bare figures may present an entirely misleading concept of the importance of the chemical industry; nearly all of the other Argentine industrial activities and much of the nation's agriculture depend, at least in part, upon supplies of chemical products. On the other hand, while Argentine has been successful with her caustic soda, sulphuric acid, ammonia, glycerine, tartaric acid, butyl alcohol and a number of other chemical plants, a substantial number of attempts to operate chemical factories of one type or another have resulted in failure.

Generally speaking, the chemical industrialization of Argentina has been largely in an effort to "carry on," to continue and increase manufacture of products for the home market, now cut off by the "all-out" war. Argentina's total imports of chemicals were valued at $28,870,000 in 1938; of this, the United States supplied roughly one-sixth, or $5 million. By 1941, U. S. chemical exports to Argentina had grown to $14,200,000.

Quebracho and urunday extracts, export products par excellence, are safest bets to hold their export field, though this may necessitate a price arrangement. Tartaric acid (646.3 tons exported during the first 10 mo. of 1944), shark liver oil (97 tons for the first 10 mo.), animal liver juices and concentrates (149 tons and 576.7 tons, respectively, for the first 8 mo. 1944), linseed oil (21,949.5 tons for the first 8 mo. 1944), whale oil (1,938.3 tons first 8 mo. 1944), and such small items as essential oils and medicinal leaves, roots and seeds, give indication of continued and increasing exports, especially during the early postwar years.

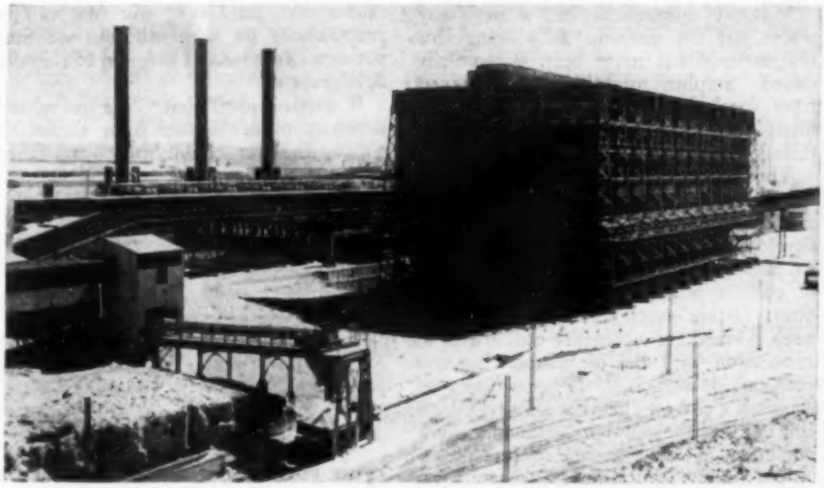
Any thought, though of establishing a barter of Argentine chemical products for U. S. chemicals, engineering services and equipment is considered by local opinion

as wishful thinking. The very nature of Argentina's "wartime" chemical industry, the natural lack of essentials of heavy chemical production, in addition to the existing scarcity of facilities, equipment and general technological training and experience entirely preclude any such possibility.

Argentine Exports of Chemicals to the U. S.

Group	8 Months 1944, Kilograms
Medicinals	1,319,679
Chemical specialties, edible	31,083,785
Industrial chemicals	28,859,987
Tanning	59,152,806
Fertilizers	56,803,016
Perfumes—essential oils	1,541

While it is certain that Argentina will offer an even extended field for postwar U. S. chemical exports, payment for these will have to be met, in part, by agricultural, pastoral and fishery products; and largely, by digging deep into the present favorable dollar balance.



Nitrate furnaces and graining operations at Chilian nitrate plant, Pedro de Valdivia. Future prospects are vague due to synthetic industry

CHILE

C. C. CONCANNON *chief of the chemical unit of the Bureau of Foreign and Domestic Commerce, spent eight months recently in Chile as special consultant to that government. A three-year plan designed to speed construction of a framework for a chemical industry was drafted as a result of Mr. Concannon's survey of the situation.*

Chile is a land of contrasts, stretching from the subtropics to the antarctic, about 2,800 mi. in length with an average width of not much more than 100 mi. and with a terrain of every conceivable character. It is a land of riches and low incomes, but all things taken into consideration Chile is a country of great opportunity. And it is undeniably evident that chemical activities are destined to play an important part in its development.

Chile has in the past imported most of its chemicals and allied products and it is expected that this situation will continue for some time to come. Even though present plans are effectuated and home production reaches considerable proportions there will be a continuing demand for imports of raw materials, intermediates, and consumer goods. Experience shows that as a given area becomes industrialized and the standard of living rises, there persists a growing demand for imported materials and goods. It may, therefore, be assumed that Chile, barring unforeseen economic difficulties, will continue to import chemicals and allied goods and the United States should continue to enjoy a good and perhaps an increasing demand for such lines. No casual consideration on the part of our exporters will be sufficient, but studied and determined efforts will be necessary if our predominant position in the market is to be maintained.

There has been a steady growth in Chilean imports of chemicals and allied products—$14,500,000 in 1940 to $20,000,000 in 1942 and the current rate of shipments is higher and would be considerably increased if goods were available in the United States and other supplying sources. The United States has at present by far the greatest stake in this business, a significant change occurring in 1941 when the relative proportions were United States 59 percent, Germany 3 percent, Great Britain 9 percent as opposed to the 1938 status—United States 27 percent, Germany 25 percent, Great Britain 10 percent. Included among these imports are industrial and synthetic chemicals, pharmaceuticals and toilet preparations, artificial fertilizers, explosives and matches, naval stores, paints, dyes and colors.

A passing reference to Chile's nitrate of soda export business is necessary because of the important position that product occupies, not only in the economy of the country but also in the affairs of the world. The establishment of synthetic nitrogen plants throughout the world tends to make vague the future prospects of Chile nitrate. It is not likely, however, that the synthetic product will completely supplant the natural product though it seems possible that the existing strong demand for natural nitrate may suffer some eclipse. Various factors and circumstances will determine the relative position but one of the developments favorably effecting Chile nitrate is the recently completed wholly mechanized Victoria plant of Compania Salitrera de Tarapaca y Antofagasta. Tarapaca, rated at about 200,000 tons per year as against 400,000 for Maria Elena and 1,000,000 for Pedro de Valdivia, already established Guggenheim plants, is the latest word in working efficiency and is expected to operate at a saving in the present cost of production—a matter of considerable consequence in postwar competition.

It is not possible here to make more than very limited reference to the raw materials plans and progress involved in developing chemical production in Chile. No country can establish a national industrial economy without an adequate supply of sulphuric acid and it should be reasonable in price and of proper quality. The current need for sulphuric acid in the Santiago industrial area is approximately 25 tons a day, an amount very small in comparison with the 9,000,000 tons produced in the United States each year. There is one local chamber plant rated at 20 tons daily but it actually produces but half that amount. This output has been selling in recent times at prices five or six times greater than the price of acid in New York. This is not a new problem but is one of long standing and has reached an acute stage—measures to correct the situation should be taken at once.

The know-how and the materials are available within Chile to construct lead chambers. But for contact plants which are needed in the Santiago area and elsewhere as well as equipment and technical experience for these, the country will have to seek outside assistance.

A Real Problem

An adequate supply of low-priced alkali is a real problem in Chile for many reasons. The wide divergence of raw materials—salt in the north, coal in the south—a total national consumption amounting to less than the output of what might be considered an economic producing unit, and other factors, make the utilization of ammonia-soda process difficult. The salt deposits in the north are among the best in the world, in connection with which electrolytic production of alkali might be employed, but there is at present very little consumption of chlorine, distribution and use not yet being organized, though there is a substantial need for this product in water purification and otherwise in various parts of the country. With soda ash and caustic soda the solution for the time being at least is to continue to import the country's requirements.

Volcanic sulphur is found in many places but the problem of winning this raw material has never been economiclly solved. Sulphur might also be obtained from local pyrites, and one copper refinery dissipates enormous quantities through its chimney.

The coal distillation industry is at present dependent upon importation of crudes and intermediates but facilities are being developed in connection with the Santiago gas works to utilize the 12,000,000 liters of coal-tar produced annually. Coal deposits farther south at Concepcion have been worked for a century and there, in connection with the oft-planned but not yet started steel mill, is opportunity to establish a coal-tar chemical industry. With this industry the country has the know-how and more or less adequate equipment.

The local chemical industry has not yet utilized the enormous forest resources of the country to any extent, but there is a small wood distillation plant and plans have been made to go into the wood chemical and cellulose phases in a comprehensive way. In this connection, there was recently in that country on loan to the Chilean Government a forestry mission of five United States Government experts.

Another mission of experts is now in Chile mapping the fish resources of the Humboldt Current off the coast of Chile, one of the richest fishing grounds in the world, and it is expected that vitamins, oils, meal and fertilizer in large quantities will one day be forthcoming. Technical experience as well as equipment in large amounts will be needed for freezing and processing fish.

The electrochemical potentialities of Chile are great but there is limitation here as elsewhere in the production picture, for example, by the smallness of lime deposits for making calcium carbide. There are mountains of sea shells in the deep south but there is always the obstacle of great distances and lack of transportation facilities.

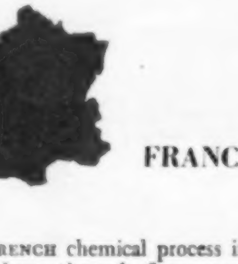
Developing Resources

No story about Chile would be complete without reference to the Corporacion de Fomento de la Produccion, a government agency set up five years ago to develop the resources of the country with the view to raising the standard of living of the people. The development corporation, probably the outstanding organization of a type which has been set up in many Latin American countries, has been successful in many respects and has unquestionably justified its existence.

There is no lack of well qualified engineering in Chile but there is a lack of practical know-how which can only come with experience.

In connection with the chemical situation in Chile and the relation thereto of the United States (in supplying capital, broad experience, engineering technique, materials and equipment), there is one most important factor which cannot be overlooked—the element of time. In commenting on this point Dr. Eduardo Cruz Coke, professor of chemistry in the Natinal University, speaking last year in the the Chilean Senate said, in substance, "We cannot wait until next year, nor can we procrastinate for a month, but we must put into effect today a program of chemical development."

It seems evident that Chile has what is necessary or can obtain from abroad the wherewithal for establishing a substantial chemical economy.



FRANCE

The French chemical process industries have been through five years of war. Five years of the most severe punishment any industrial plants ever experienced. Production was pushed to the utmost by ruthless masters who cared nothing for the appearance and condition of the plant and equipment.

According to meager reports, the Germans when forced out of France did not destroy industrial plants as they did in Italy. Perhaps the rate of retreat left them little time for malicious destruction. Nevertheless, the strain of the great demand for increasing production and the shortage of materials made it impossible to maintain the equipment properly. Therefore, while the French plants were not burned or dynamited, they are sorely in need of paint and repairs. To restore these plants to their prewar condition will call for an enormous volume of motors, pumps, filter presses, and every conceivable type of chemical engineering equipment. Much of this demand will be for American machinery.

Until the French chemical plants can be restored to operating condition there is going to be a constantly increasing shortage of chemical products. French potash comes from mines in Alsace which (early in February) are still behind the German lines. Germany has drained all available oils and fats out of the country for the benefit of her own people leaving the French supplies of these materials, and necessarily glycerine and soap, in a depleted condition.

The coal shortage means a lack of such byproducts as coal tar and its derivatives. It also means a lack of numerous other chemicals the production of which is dependent on coal as a fuel. The almost complete destruction of the transportation system of the country is proving to be a severe handicap to the manufacturing industries.

Thus the end of the five years of war finds the French chemical process industries badly worn, her stockpiles of chemical products depleted, and the only hope of restoring either is assistance from the United States in the form of equipment and chemicals.

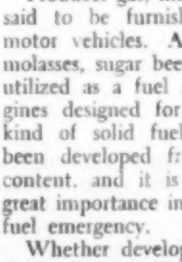
There is a possibility that entire plants will be moved to France soon in connection with the problem of supplying the western front. Frank L. McNamee, Philadelphia regional war manpower director, on his recent return from that country quotes General Dwight D. Eisenhower as one source of this information (*Wall St. Journal*, Philadelphia dateline of Jan. 18, AP).

Since 1940, France has been faced with the problem of maintaining essential activities through development of synthetic fuels, supplemented by whatever allotments were made by Germany (*Foreign Commerce Weekly*, June 3, 1944). After more than three years of research and experimentation, a number of substitute fuels have been found, the production of which can be undertaken on a commercial basis.

Production of synthetic liquid fuel has been hampered by supply of equipment for electrification. Efforts have been made to produce gasoline from shale, brown coal, peat, and plant residues, and in some cases success has been attained. Two plants are said to be producing oil from shale, of which there are appreciable quantities in the country, and a third plant is scheduled to go into operation soon. Carbonization of hard coal is being carried on in installations in northern France, where a special process reportedly has been developed.

Producer gas, made largely from peat, is said to be furnishing fuel for 120,000 motor vehicles. Alcohol, produced from molasses, sugar beets, and raisins, is being utilized as a fuel in special types of engines designed for the purpose. A new kind of solid fuel called Gazocoke has been developed from coal with low-ash content, and it is said to have been of great importance in relieving the country's fuel emergency.

Whether development and use of synthetic fuels in France will be continued after the war remains a question. Foreign sources believe that there is a strong possibility of such a trend.



COLOMBIA

RENE GRAU *is a member of the Instituto de Formento Industrial at Bogota. Colombia has one of the most active and successful of these institutes for industrial development to be found in all of the Latin American countries. This government sponsored agency is also interested in encouraging cooperation between that country and the United States.*

Colombia is much more of a consumer than a direct producer of chemicals. Ethyl alcohol is the only conspicuous organic chemical produced in appreciable amounts. The principal chemical consuming industries are textiles, leather and leather products, rubber and rubber products, soap, candles, matches, paints and varnishes. The chemical industry holds the sixth place in category of importance

Its development has been noticeable since the beginning of the war. During the last four years, there has been a widespread outcropping of small plants producing a variety of pharmaceutical specialties and also, with government support, the beginnings of a heavy chemical industry.

Between 1934 and 1942 there was an increase of from 17 to 125 chemical plants, a large increase in capital and production. One of the most important factors in this development has been official government support, through the Instituto de Fomento Industrial established in 1940. The Instituto has a paid capital of $3,990,000 and had by June 30, 1944, invested over $2,105,000 in 19 different industrial projects including a sulphuric acid plant and the manufacture of various types of fertilizers.

Until recently, almost all chemical and pharmaceutical products manufactured in Colombia were based on imported chemicals and drugs. The Industria Quimica Colombiana S. A. ("Inquico") at Medellin, produced various textile, tanning, and other chemicals at least partly from domestic raw materials. The Fabrica Nacional de Oxigeno y Productos Metalicos S. A. ("Fano"), a subsidiary of Svenska Aktiebolaget Gasaccumulator, Stockholm, has since 1931 been manufacturing oxygen, and on a small scale calcium carbide derivatives in Barranquilla, Bogota, and Medellin. The Tropical Oil Co. has for some years been producing various petroleum byproducts in its refinery at Barrancabermeja. By 1941 there were two factories, the Fabrica de Pinturas y Colores "Iris" S. A., Bogota, and Flesh & Co., Barranquilla, making dry colors and paints, in part at least from domestically produced blanc fixe and calcium carbonate. A Barranquilla plastics manufacturer, Industrias "Resol," started producing phenolic resin on an experimental scale in 1942. The year 1944 saw the start of production by the Industrias del Mangle S. A., Buenaventura, of tanning extract from mangrove bark secured in the vicinity. Some of the larger plants are now employing a majority of Colombian botanicals in the preparation of their pharmaceutical specialties.

Import Difficulties

The difficulty of securing certain imports after the outbreak of the war in Europe, and particularly after Pearl Harbor, was an additional factor in the recent development. The reduction in imports resulted in price increases, making domestic manufacture of certain chemicals more attractive. Furthermore it threatened the economy of the country, adding impetus to the formation and activities of the Instituto whose constant and systematic research in this field promises an unlimited expansion of the chemical industry in Colombia.

Germany was the principal supplier of drugs, fine chemicals, dyestuffs, etc., and its goodwill and standing in this line had no counterpart, particularly in the pharmaceutical specialties. Germany's dominant position in the Colombian market, not taking into consideration the many instances in which German prices were considerably less than American, was specially due to: service, research, credit terms, and aggressive salesmanship with their propaganda machine working full blast. It could never be said at any time that there has been prejudice against American products, but there still remains the prevalent belief among certain sections of the consuming public of the better quality of the German products.

SOUTH AFRICA

G. D. LOUW *received his chemical education in the universities of his native country, the Union of South Africa, and served the industry for some years. He is now in the United State as a member of his government's Scientific Mission.*

THE CHEMICAL process industries in the Union of South Africa have expanded greatly during the present war. This expansion was possible largely because there already existed a substantial heavy chemical industry which developed along with the great gold mining industry of the Witwatersrand. An extension of prewar plants together with new plants erected, enabled the Union to produce important quantities of chemicals required for war purposes.

Due to the needs of the mining industry, especially in explosives, there were already produced in the Union large quantities of synthetic ammonia, nitric acid, sulphuric acid (partly from pyrities and partly from imported sulphur), ammonium nitrate, carbide and sodium cyanide. The waste sulphuric acid from the nitration plants is used to produce superphosphate from imported rock phosphate although at one factory sulphuric acid is produced almost solely for the purpose of manufacturing this fertilizer.

A large variety of coke-oven byproducts are produced although the types and quantity of such production are limited by the small demand which exists for some of the many possible derivatives. The coal deposits of the Union are large and the present output is in the neighborhood of 20 to 25 million tons per year. There has, however, been very little development in plastics and such articles as are produced from plastics are at present made from imported raw materials. The possibility of utilizing coal as the basis of a chemical industry is being investigated.

The Union has no production of natural oil but there are limited deposits of oil shale. This shale is used to produce crude oil, which together with imported crude is subsequently refined to petrol. The production however, is less than 3 percent of the Union's requirements.

There are three paper mills in the Union although only one manufactures its own pulp from South African raw materials. Due to the small demand for certain kinds of paper a limited range of papers is produced. As byproducts there emerge some valuable chemicals such as liquid chlorine, hydrochloric acid and chloride of lime. The purification of salt is accessory.

The tanning industry has expanded to such an extent that it has stimulated the Union into production of chrome tanning salts. Because of the availability of chrome salts the manufacture of chrome pigments has commenced. Chrome tanning salts and wattle extract are produced in excess of demand and large amounts are exported.

The Union has a large sugar industry. Some of the molasses is utilized to produce alcohols, ether and lactic acid. Some alcohols are converted to acetates which are used to produce thinners and solvents. Other solvents produced are carbon tetrachloride and carbon bisulphide. The extensive wine industry produces, apart from consumable liquors, alcohol, cream of tartar and vinegar, but has to import its requirements of potassium metabisulphite.

The glass industry has greatly increased its production of bottles and other containers, but there is as yet no plate glass production. Sand suitable for glass production is available and sodium carbonate is obtainable from Lake Magadi in Kenya but smaller quantities of other chemicals must be imported.

Dips and insecticides are produced in large amounts. Sodium arsenite, lead arsenate, pyrethrum extract and sulphur dust are produced but arsenious oxide, nicotine, pyrethrum flowers and sulphur are imported. The production of DDT is about to commence.

Well-Developed Industries

A great many industries are well developed and are capable of supplying much more than the Union's present requirements of finished products, but are almost entirely dependent on imports for their raw materials. Among these may be classified soap, rubber, paint and polish industries.

To sum up, it can be said that in the chemical field new products manufactured in the past few years include chrome salts, chrome pigments, sodium sulphide, lactic acid, liquid chlorine, liquid sulphur dioxide, litharge, silver nitrate, ultramarine blue, carbon tetrachloride and carbon bisulphide Nevertheless, a considerable amount of raw materials or partly manufactured materials are still imported to meet the requirements of local industry. In the chemical field some of the primary items imported are:—accelerators, acetic acid, ammonium chloride, ammonium sulphate, arsenic, barium chloride, bentonite, borax and boric acid, calcium chloride, carbon blacks, citric acid, cyanamide, formaldehyde, gums, lining compounds, mining flotation reagents, nicotine sulphate, paint driers, photographic chemicals, phosphate rock, pigments, plastics, potassium salts, resins, rosin, sodium hydroxide, sodium carbonate, solvents, sulphur, tartaric acid, and zinc oxide.

Partly in order to study the possibilities of expansion in the field of chemical processing, the government of the Union of

South Africa has established at Washington, D. C., a scientific mission, members of which are prepared to give more detailed information than it is possible to set forth in a summary such as this.

IRAN

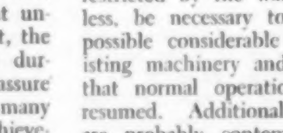
The immediate postwar market prospects in Iran for chemicals and allied products are favorable but the outlook for chemical equipment is somewhat uncertain. Financed by the government, the program of industrial development during the past 15 years, designed to assure a greater degree of self-sufficiency in many products, represents an impressive achievement for a predominantly agricultural country. Cost of this program, however, placed a heavy burden on public finances, which, together with economic dislocations resulting from the war, including Allied occupation of parts of the country, have not only forced the postponement of any additional projects, but have hampered operations of existing plants which is now serious.

Projects completed under the industrialization program include chiefly plants for the manufacture of textiles, foodstuffs, matches, chemicals, paper and cardboard, as well as distilleries and refineries for sugar and vegetable oils. These have provided a steadily increasing proportion of domestic needs, but they have apparently exerted only a minor influence on the imports of chemicals and allied products, which amounted in 1939 to $1,500,000, or about double those of 1934. Difficulty in obtaining many of these chemical needs during the war period, however, is likely to be reflected in an abnormally heavy demand, at least temporarily, when hostilities cease. The major items in this trade are pharmaceuticals and dyes (chiefly for the carpet industry), and to a lesser extent tanning materials. Germany has been the principal source for these products, while the share of the United States has been small. The local chemical industry has been a minor factor in the supply of these products, its output includes primarily sulphuric and hydrochloric acid, alcohol, explosives, ether, sodium carbonate, caustic soda, coke and byproducts, potassium bichromate, and sodium carbonate. A good proportion of the raw material requirements of the chemical industry is obtained from local sources. In addition to the government plants and some private enterprises, there is also located in Iran (at Abadan) one of the world's largest oil refineries, operated by the Anglo-Iranian Oil Co.

Payment for the import requirements of Iran's industrial program, including chemical plants, has heretofore been effected chiefly by exports. A chronic shortage of foreign exchange has been primarily responsible for this policy, which has resulted in a considerable expansion of barter or compensation trade.

Although the Iranian Government receives substantial royalties from the oil concession of the Anglo-Iranian Oil Co., it apparently earmarked these funds in the past mainly for special purposes, particularly military. However, since the deposition of the former Shah, there has been a tendency to utilize these revenues for more general needs of the country. Excluding oil, imports into Iran usually exceed the value of exports.

At present the Iranian Government is preoccupied with major problems of economic readjustment, including restoration of foreign trade, which has been sharply restricted by the war. It will, nevertheless, be necessary to obtain as soon as possible considerable spare parts for existing machinery and apparatus in order that normal operations may be quickly resumed. Additional industrial projects are probably contemplated, in view of the comparatively limited development to date and the various unexploited resources of the country, but their undertaking will doubtless have to await the return of more normal world conditions.



CENTRAL AMERICA

GEORGE ACUNA *has been identified with perfume and essential oil companies in France, Brazil, Costa Rica, British West Indies, and the United States. Dr. Acuna is now with Van Dyk & Co. of New Jersey where he is in charge of the export department giving special attention to Latin American trade. He has been for many years a member of the Faculty of Engineers of Costa Rica.*

The low living standard of the peoples of Central America makes industrialization particularly difficult. The economy of each country is closely interwoven with the individual political entity, sometime changeable in definite periods. Under such conditions, the already small purchasing power is subject to political restrictions.

However, industrialization of these countries is badly needed. This is the moment for American engineers to enter the picture. They must consider all conditions: soil, social, and political; discuss with governments involved the various industries contemplated, and above all, the lifting of customs among the six republics. They must standardize costs, profits, and working conditions. The program should be developed in cooperation with the government, the national bank and the technical counsel of the republic. Plants must be of limited capacity.

A sort of Lend-Lease on long terms is expected of the United States by this economic bloc of Central America for the purpose of rational industrialization. Capable engineers, equipment, and raw materials for new industries will be necessary. Also, they will need finished products that cannot be manufactured locally at present. These are to be brought in after negotiating free entrance with the governments of the six republics. In payment for the building of the industrial plants, the United States will be given the position of the favored nation by this group of peoples.

This program will naturally improve the standard of living, and make the people realize that the United States has helped them in a realistic manner and not with political phraseology. The result will be much closer relationships between these countries and the United States.

SYRIA & LEBANON

Prospects for the chemical trade of these two small territories, which are just beginning life as independent nations, will be influenced largely by industrial developments. Manufacturing activity up to now has been confined to the production of textiles, foodstuffs, shoes, furniture, soap, alcohol, beer, glass, paints, matches, and cement, primarily for the domestic market. Information about future plans is meager, but it is highly probable that the present independent governments (French mandate over this territory was terminated in November, 1943) will take a more active interest in industrial planning, a tendency which has become increasingly stronger in recent years among Near East countries.

The consumption of chemicals and allied products here has shown only a moderate increase in recent years. In 1938 the total imported was valued at $1,500,000, most of which came from Great Britain and France, while the United States supplied small quantities of medicinal preparations, cosmetics, paints, and chemicals for agricultural use. The contribution by local industry has been small, comprising chiefly ethyl alcohol, essential oils, and soap, all of which use mainly domestic raw materials.

Industry Slow to Develop

The slow development of industry in Syria and Lebanon may be attributed to a number of causes, among which are the predominantly agricultural character of the area, the limited mineral resources, notably the lack of coal and oil, and scarcity of capital. Greater utilization of hydroelectric resources has increased somewhat the power available for industries, while the oil refinery at Tripoli, a terminus of the oil pipeline from Iraq, has made oil supplies more accessible. Although this refinery is relatively small, it may form the basis for a more extensive project as construction equipment becomes available and demand for its products increases.

COMMODITY REVIEWS

SULPHURIC ACID AND SULPHUR

Despite dire predictions to the contrary, production of sulphuric acid came close to meeting all needs in 1944. It was, however, necessary to put this chemical under nationwide allocation before the year end. New records were reached by both production and use.

ALWAYS the capstone product of the chemical industry, sulphuric acid was called on for new production feats in 1944. The industry met the test, requiring considerable new construction to do so, however, and pushing existing plants to the limit. Owing to the fact that plant ratings are generally conservative and a good deal more than 100 percent of rated capacity can usually be secured for long periods of time without too much strain on the equipment, most demands were met with only a small deficit. Still, it was necessary to scale down previous estimates of superphosphate needs in achieving this balance, while the WPB found it essential in November to put all sulphuric acid under allocation to assure an approach to balance between output and needs in 1945.

The industry is still being built. Several new plants are in process of construction, while several others are being enlarged. At the close of 1944, WPB estimated total annual capacity for virgin acid at 9,341,000 short tons on a 100 percent H_2SO_4 basis, compared with 8,393,100 tons at the close of 1943. When (and if) present construction is completed, the projected annual capacity will be 9,913,000 tons. All of these figures are exclusive of the capacity of government plants for ordnance acid, which are not released by WPB. Nor do they include the duplication inherent in the fact that a considerable amount of spent acid is available, both from alkylation plants and from ordnance plants, for use in fertilizers and certain other applications. Our own estimates also do not include the duplication of spent acid, since they are based on acid believed to be actually consumed, rather than the quantity going through the process. The quantity of alkylation spent that was available at any time is in doubt. Possibly 230,000 tons would represent the ordnance spent available to other industries during 1944.

In contrast to the prewar situation when *Chem. & Met.'s* estimates were the only published sulphuric acid figures, except for the Census production data (and fertilizer acid consumption figures of this same agency), WPB now prepares careful requirement estimates which are modified as the changing situation may demand. Furthermore, production figures (less ordnance acid) are released monthly. Consequently, it is with a certain trepidation that *Chem. & Met.* continues its practice of earlier years of presenting estimates in detail for both production and consumption. Our figures as in the past attempt to give the overall picture, including ordnance acid production and consumption, however combining figures in instances necessary for war security reasons.

One minor departure from past practice which will bring our data into line with industry usage is to report on the basis of 100 percent acid, rather than 50 deg. Bé., a practice which we followed in earlier years because Census reports were still on the latter basis. Since monthly reports were started in 1944 by the Census Bureau, however, the reporting basis has been 100 percent, a standard to which we gladly shift.

Production of virgin acid during 1944, including acid from both private and government-owned plants, is estimated at 9,040,000 short tons on the 100 percent basis, which is 4.5 percent above the 1943 estimate of 8,655,000 tons. The phenomenal increase since the last strictly prewar year, 1939, is clearly indicated on one of the accompanying charts. It amounts to almost 80 percent. About 64 percent or a little more was produced by the contact process, the remainder in chamber plants. The ratio in favor of the contact process is of course on the increase since all but a few hundred tons of daily acid capacity built in recent years has been in contact plants.

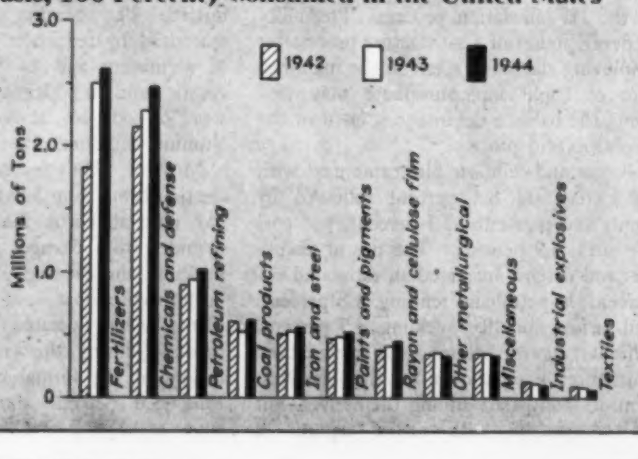
ACID SOURCES

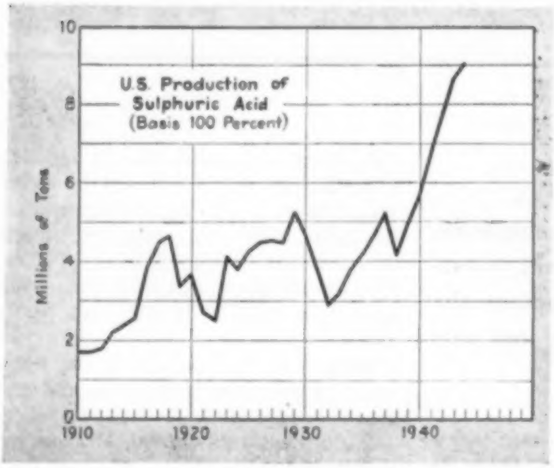
How this acid production rate was reached with the available raw materials is indicated in one of the accompanying tabulations which is based on trade opinions, *Chem. & Met.* estimates and, in the case of certain figures (sulphur production, stocks and domestic shipments, and smelter production for years before 1944), on Census or Bureau of Mines data. Sulphur mining reached a level not much below its previous peak and is estimated at 3,200,000 long tons. By withdrawals from mine stocks, shipments were at an all-time high rate and approximated 3,570,000 tons. Combined exports and non-acid uses estimated at 1,600,000 tons leave 1,970,000 tons available for acid. Actually, sulphur

Estimated Distribution of Sulphuric Acid (Basis, 100 Percent) Consumed in the United States

Consuming Industries	1942 Short Tons (Revised)	1943 Short Tons (Revised)	1944 Short Tons
Fertilizers	1,835,000	2,500,000	2,620,000
Petroleum refining	900,000	940,000	1,020,000
Chemicals and defense*	2,145,000	2,285,000	2,425,000
Coal products	605,000	580,000	620,000
Iron and steel	510,000	535,000	560,000
Other metallurgical	350,000	360,000	340,000
Paints and pigments	475,000	495,000	530,000
Industrial explosives	120,000	115,000	110,000
Rayon and cellulose film	390,000	415,000	450,000
Textiles	90,000	85,000	75,000
Miscellaneous	350,000	350,000	340,000
Totals	7,780,000	8,650,000	9,090,000

*Combined to avoid disclosing estimates of direct war applications.





Data and Estimates on U. S. Sulphur Activity and Sulphuric Acid Production, 1942–1944

(Sulphur and pyrites in long tons; acid in short tons, 100 percent acid)

	1942 (Revised)	1943 (Revised)	1944
Sulphur mined[1]	3,496,000	2,574,800	3,230,000
Sulphur exports[2]	....	....	....
Total shipments[3]	3,164,000	2,990,000	3,570,000
Approx. mine stocks at end of year	4,300,000	3,841,000	3,550,000
Non-acid uses of sulphur[4]	1,325,000	1,500,000	1,600,000
Sulphur available for acid	1,839,000	1,490,000	1,970,000
Change in consumer stocks	+85,000	−500,000	−50,000
Acid from sulphur	5,620,000	6,365,000	6,465,000
Domestic pyrites[5]	1,020,000	1,020,000	1,250,000
Acid from pyrites	1,405,000	1,370,000	1,655,000
Acid from smelters	696,000	865,000	860,000
Acid from hydrogen sulphide	61,000	55,000	60,000
Total sulphuric acid made	7,782,000	8,655,000	9,040,000

[1] Includes sulphur mined on the Gulf Coast, plus western sulphur, recovery from fuel gases and sulphur imports from Trail, B. C., which are lumped to avoid disclosing estimate of imports. (No imports in 1944, however). [2] Lumped with non-acid uses to avoid disclosing estimate of exports. [3] Total shipments include exports. [4] Includes sulphur exports. [5] Includes imports.

going to acid was apparently somewhat more and it is believed that stocks outside the mines, including consignment stocks and those belonging to consumers, were drawn on to the extent of about 50,000 tons, making the total for acid 2,020,000 long tons, equivalent to 6,465,000 short tons of acid (100 percent).

Although pyrites imports are not known accurately, it is probable that the sum of domestic and imported pyrites was close to 1,250,000 long tons, yielding about 1,655,000 short tons of acid. Smelter production of acid, probably slightly less than that reported for 1943 by the Bureau of Mines, is taken at 860,000 tons, and acid recovered from the H_2S in sour petroleum gases, at 60,000 tons.

Except in industrial explosives, textiles, miscellaneous and metallurgical uses other than iron and steel, 1944 consumption increased in all major fields as compared with 1943, as shown in the tabulation of uses on the preceding page. Total consumption of 9,090,000 short tons of acid (100 percent basis) was 5.1 percent in excess of the estimate of 8,650,000 tons in 1943. The largest tonnage increases occurred in the chemicals and defense, and fertilizer, classifications although the largest percentage increase, 8.5 percent, was in petroleum refining where the sulphuric acid alkylation process for aviation gasoline held up well against the inroads of the HF alkylation process. Possibility of development of a satisfactory process for employing alkylation spent in the manufacture of triple superphosphate may well swing the balance definitely in favor of the sulphuric acid process.

Rayon and cellulose film came next with an increase of 8.4 percent followed by paints and pigments, 7.1 percent, and coal products, 6.9 percent. The use in chemicals and defense increased an estimated 6.1 percent; in petroleum refining, 4.8 percent; and in iron and steel pickling, 4.7 percent. This last figure requires some explanation. The three years shown for this classification are consistent among themselves, but on comparison with earlier reports in *Chem. & Met.* will appear low. It has recently been determined through detailed analyses made by WPB that our earlier figures for iron and steel contained duplication of the acid used in steel plants for making ammonium sulphate. This duplication has therefore been eliminated in the three year estimates currently presented.

ALKALIS AND CHLORINE

Considerable increases in production and consumption of soda ash, caustic soda and chlorine were experienced in 1944, with new records all along the line. Supply was generally tight for these chemicals, although only chlorine has been under allocation.

In common with most of the chemical industry, the heavy alkalis and chlorine reached new peaks in 1944 in almost every branch. Probably the only exception was the production of lime-soda caustic which, after two years somewhat below the peak 1941 level, returned in 1944 to substantially the same top production rate. The increases in 1944, compared with 1943, were not as large by a considerable margin as were those of 1943 compared with 1942, but they were still substantial and permitted a good approximation of supply and demand in most regions, at most times. Supply was generally tight, but not so tight that increased caustic exports could not be permitted. The soda ash situation was eased materially by reduction in the production of aluminum and by the use of liquid caustic from an adjacent chlorine plant, instead of soda ash, at one of the southern alumina refineries.

Most of 1944's increased soda ash production came from Solvay's new 200-ton-a-day unit at Baton Rouge, with the remainder from changes eliminating bottlenecks in the existing plants.

Both ammonia soda and natural soda plants were operated at, or close to, capacity during the year, with a record output at the former of 4,535,498 short tons, 3.0 percent above the 4,407,600 tons of 1943; and at the latter, an estimated 179,000 tons, or nearly 10 percent higher than the 163,523 tons of 1943. Total soda ash production thereby reached approximately 4,717,000 tons, according to estimates based on the latest Census figures, compared with 4,571,127 tons in the preceding year. This total is still believed to include about 18,000 tons of electrolytic soda produced in pulp mills. For comparison with the highest year before the start of World War II, the figures of 1937 are illuminating. In

Production of Caustic Soda in the United States

(Short Tons)

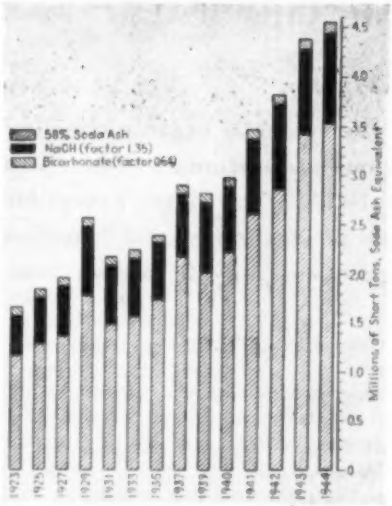
Year*	Lime-Soda	Electrolytic	Total
1921	163,044	75,547	238,591
1923	314,195	122,424	436,619
1925	355,783	141,478	497,261
1927	387,235	186,182	573,417
1929	524,985	236,807	761,792
1931	455,832	203,057	658,889
1933	439,363	247,620	686,983
1935	436,980	322,401	759,381
1937	488,807	479,919	968,726
1939	532,914	492,132	1,025,046
1940 (estimated)	505,000	595,000	1,100,000
1941	685,999	743,316	1,429,310
1942	634,291	939,878	1,514,169
1943	663,495	1,036,577	1,700,072
1944	689,565	1,205,039	1,894,604

* Figures for 1921-1943, except 1940, are from the U. S. Bureau of the Census. Prior to 1939 electrolytic caustic soda figures did not include that made and consumed at woodpulp mills, estimated at about 30,000 tons in 1927 and 1929, at about 24,000 tons in 1931, 21,000 tons in 1933, 20,000 tons in 1934, 17,000 tons in 1935, 19,000 tons in 1936 and 1937, and 18,000 tons in 1938.

that year ammonia soda production amounted to 2,918,668 tons, and natural soda to 118,753 tons, totalling 3,037,421 tons.

Tonnagewise, the increases in caustic soda and chlorine, of course, are less impressive, although the percentages are greater. According to preliminary Census figures, it appears that the 1944 production of caustic soda, except for the rather small unreported portion made in government arsenals, totaled about 1,894,600 tons. Of this, 1,205,039 tons were electrolytic, and 689,565 tons was made by the lime-soda process. The total is about 11 percent over 1943, the comparable figures for that year being a total of 1,700,072 tons, made up of 1,036,577 tons of electrolytic and 663,495 tons of lime-soda caustic.

The accompanying table of caustic production illustrates strikingly the remarkable rise in electrolytic production. Since 1923, electrolytic soda has increased almost ten times, whereas the increase in lime-soda caustic in the same period was barely more than twice. (Even so, caustic demand was so great in 1944 that lime-soda caustic was produced up to the limit of the available ash.) Tremendous increase in the requirements for chlorine furnishes the answer. Aside from production in government plants, the total of 1944 chlorine output is 1,252,768 tons, some 3.4 percent more than the 1,211,920 tons of 1943, and about 21 percent higher than the 1942 rate. For the first quarter of 1945 WPB expects production of about 340,000 tons. Direct war uses and the pulp industry are thus expected to receive more.



Production for sale of principal ammonia soda products

It may be noted from the 1943 and 1944 figures that chlorine output appears not to be in balance with the output of electrolytic caustic. The answer lies in the fact that some chlorine is produced by processes in which no caustic soda is produced, while another part is made by salt electrolysis in plants which do not recover the caustic. For example, in 1944, we believe that about 86 percent of the chlorine, or 1,070,000 tons, was made jointly with recovered caustic, while some 130,000 tons, or nearly 10 percent, was produced by non-caustic processes including metallic sodium, sodium nitrate from salt, caustic potash and electrolytic soda ash. The balance of 50,000 tons, was produced in plants not equipped for caustic recovery. Our 1943 estimates, made during a year when a large plant without caustic recovery equipment was still in operation, showed 935,000 tons of chlorine produced with caustic, 147,000 tons produced in plants wasting the caustic cell liquor, and about 130,000 tons by non-caustic soda processes.

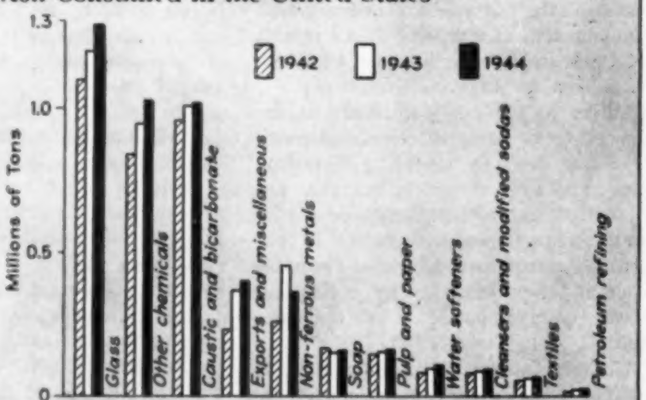
The peculiar situation, where chlorine plants were authorized and built without caustic finishing equipment in some cases, arose from the feeling on the part of many people in the prewar years that the demand for caustic could never keep up with the greatly increased need for chlorine. The fallacy in this theory was demonstrated in 1943 and again in 1944, with the result that the missing equipment was hastily installed at some of the plants when it was

(*Continued on page 141*)

Estimated Distribution of Soda Ash Consumed in the United States

Consuming Industries	1942 Short Tons	1943 Short Tons	1944 Short Tons
Glass	1.100,000	1.200,000	1.290,000
Soap	165.000	150,000	162.000
Caustic and bicarbonate	960,000	1.010,000	1.018.000
Other chemicals	840.000	950.000	1,030,000
Cleansers and modified sodas	80.000	85,000	90,000
Pulp and paper	145,000	155,000	160.000
Water softeners	80,000	95,000	110,000
Petroleum refining	18,000	20,000	22,000
Textiles	56,000	58,000	61.000
Exports	*	*	*
Non-ferrous metals	260,000	450,000	360,000
Miscellaneous	230,000	370,000	400.000
Totals	3,934,000	4,543,000	4.701,000

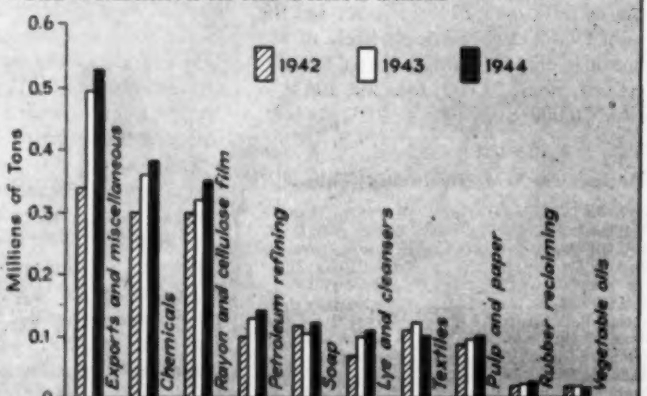
*Included in miscellaneous.



Estimated Distribution of Caustic Soda Consumed in the United States

Consuming Industries	1942 Short Tons	1943 Short Tons (Revised)	1944 Short Tons
Soap	120,000	105,000	125,000
Chemicals	300,000	360,000	380,000
Petroleum refining	100,000	130,000	140,000
Rayon and cellulose film	300,000	320,000	350,000
Lye and cleansers	70,000	100,000	110,000
Textiles	110,000	120,000	100,000
Rubber reclaiming	20,000	24,000	25,000
Vegetable oils	19,000	19,000	18,000
Pulp and paper	85,000	95,000	100,000
Exports	*	*	*
Miscellaneous	340,000	496,000	535,000
Totals	1,464,000	1,769,000	1,883,000

*Included in miscellaneous.



SYNTHETIC ORGANIC CHEMICALS

It has virtually become a habit for the synthetic organic chemical industry each year to break all previous production records. Such has been the case since 1931, with 1938 as the single exception. The year 1944 saw the industry's total production exceed 7 million tons; for 1940 the comparable figure was only 3 million tons.

OUTSTANDING developments and trends in the synthetic organic chemical industry during the past year include: (1) A record output in practically all lines, especially in the noncyclics; (2) the extraordinary technical progress made in certain fields such as chemotherapeutic agents and synthetic insecticides; (3) an accelerated trend toward a greater use of petroleum and natural gas constituents as raw materials; (4) the widening use of synthetic and semi-synthetic organics in such processing fields as those producing fibers and textile conditioners, coating materials, adhesives and plastics.

MORE DURING FORTY-FOUR

United States production of synthetic organic chemicals for 1944 reached an all-time world high by topping the 1943 output by something like 15 percent. Tonnage-wise, last year's volume exceeded 7 million tons as compared to 6.2 million for 1943, some 4.7 million for 1942 and 3.1 million for 1940.

Leader in the field, of course, is the non-coal-tar or noncyclic compounds, with a volume probably exceeding 5 million tons. The 1940 output of this class was 2.1 million tons. These figures do not include chemicals produced for use as aviation fuel or explosives and other chemicals made at Government Ordnance plants or private units producing under Ordnance control.

Coal-tar intermediates, amounting to 765,000 tons in 1943, rose probably to reach 900,000 tons in 1944—a 110 percent increase over 1940. Figures for the finished coal tars were most likely of the same magnitude. Output of coal-tar dyes declined from 73,000 tons in 1943 to below 70,000 tons.

Refineries Now Producing Toluol*

Baytown Ordnance Works	Baytown, Texas
Shell Oil Co.	Wilmington, Calif.
Shell Oil Co.	Houston, Texas
Shell Oil Co.	Wood River, Ill.
The Texas Co.	Lockport, Ill.
Pure Oil Co.	Toledo, Ohio
Sinclair Refining Co.	Marcus Hook, Pa.
Standard Oil Co. of Indiana	Whiting, Ind.
Union Oil Co.	Oleum, Calif.
Magnolia Petroleum Co.	Beaumont, Texas
Continental Oil Co.	Ponca City, Texas

* Petroleum Administration for War.

The past year has witnessed the successful large-scale manufacture of a number of near-revolutionary new organic materials of which at least two, penicillin and DDT, can lay claim to being among the most important developments of several decades. Penicillin, a fermentation product, is mentioned here because its manufacture requires a high degree of chemical engineering skill. Improvements in media and extraction techniques continue to be made.

Production of penicillin for 1944 increased some 80 times over that for 1943 to top 1,600 billion Oxford units valued at $35,000,000. It has been estimated that 1945 production will be 2.5-3.0 times greater than for last year, but that the value will not exceed $60,000,000. Output for January is estimated at about 300 billion units or close to 0.7 ton, potentially equivalent to 300,000 lives! Two largest producers are Chas. Pfizer & Sons, Inc., which turns out close to 50 percent of total domestic production, and Commercial Solvents Corp.

DRUGS AND INSECTICIDES

Atabrine, which has proved its worth as a quinine substitute, was produced in relatively large quantities and has helped to conquer malaria, our worst enemy in this Japanese war. Large-scale manufacture of atabrine consists in condensing 2,4-dichlorobenzoic acid with p-anisidine, closing the ring with phosphorus oxychloride and heating the resulting 2-methoxy-6,9-dichloro-acridine with 1-diethylamino-4-aminopentane in anhydrous phenol. Hopes, not yet realized commercially, were aroused by the total synthesis of quinine during 1944 by Woodward and Doering, who thus solved a problem that had baffled chemists for over a century.

Early in the year disclosure was made that a new gelatin molecule had been synthesized that promises to become a partial substitute for blood plasma; it is understood that limited production may now be under way. Within the past year, propethylene ether has been under clinical trial as an anesthetic which is 3-4 times as potent as ethyl ether and much less irritating.

Sensation of the insecticide field was DDT (dichloro-diphenyl-trichlorethane) which, almost from scratch at the beginning of the year, increased to a rate in excess of 12,000 tons annually. At present there are 11 commercial producers, with at least two others scheduled to begin large-scale operations within a matter of months. Improvements continue to be made in the process; one study is reported to have reduced drastically the reaction time for chloral.

One of the most important insect repellants ever developed is dimethyl phthalate, production of which dug deeply into phthalic anhydride reserves during the year. Some sources estimate that this use has already been absorbing the anhydride at the rate of 15,000 tons annually. Postwar prospects for dimethyl phthalate in insectifuge are considered reasonably promising although substitute materials are now being developed.

Production of phthalic anhydride itself has spurted from 29,000 tons during 1940 to about 65,000 for 1944. Production capacity, now at about 73,000 tons, will be upped to some 84,000 by the entrance of three new producers into the field during 1945. These, which are Standard Oil of California, Pittsburgh Coke & Chemical Co., and Koppers Coke & Iron Co., will raise the total number of producing firms to ten. Postwar-wise, it is expected that most of the enlarged production will be absorbed by the three large outlets for phthalic anhydride—alkyd resins, insectifuges, plasticizers—aided by expanded minor outlets.

For more than a year, Carbide & Carbon Chemicals Corp., has been supplying our armed forces with a new mosquito repellant based on 2-ethylhexanediol-1,3 and known as Formula 612. Indalone, produced by U. S. Industrial Chemicals, Inc., by reacting mesityl oxide and dibutyl oxalate, is an ingredient of a government-developed all-purpose insectifuge. Shell Chemical Co. has developed a promising and cheap new soil fumigant known as DD Mixture. It is actually a mixture of 1,3-dichloropropylene and 1,2-dichloropropane obtained as a byproduct in the manufacture of allyl alcohol from petroleum constituents.

Du Pont's phenothiazene has grown rapidly in recent years and present demands have been stated to exceed 2,500 tons yearly. During the year, Rohm & Haas Co. announced a unique insecticide-fungicide that is absorbed by the plant tissues from the soil, thus becoming effective against both chewing and sucking insects. Dithane, as it is known, is actually diethylene-sodium-misdithiocarbamate.

MORE PETRO-CHEMICALS

The trend toward the use of petroleum and natural gas constituents as chemical raw materials has been sharply accelerated during the past three years. It was re-

Table III — U. S. Production of Chemical Raw Materials Derived From Petroleum, 1943[1]

	Production, Short Tons
"Crudes" from petroleum	
Cresylic acid	6,958
Naphthenic acid	8,674
Hydrocarbons	
1, 3-butadiene, rubber-grade[2]	51,545
Ethylene	83,111
C_3 hydrocarbons	197,310
C_4 hydrocarbons	334,247
All other[3]	100,612
Total	782,457

[1] U. S. Tariff Commission, Preliminary Report. [2] Does not include butadiene produced from alcohol, which was 130,000 tons for 1943. [3] Represents data for benzol, xylol, and other "crudes" from petroleum and hydrocarbons; does not include petroleum-derived toluol, production of which is largely under Ordnance control.

cently estimated by authorities in the field that about 175 industrial organic chemicals are now being manufactured from petroleum bases. About a third of this number is shipped in tank car quantities.

While the variety and value of petrochemicals are great, the volume is insignificant when compared to the total available supply of petroleum hydrocarbons. In 1944 the estimated volume of organic chemicals (excluding gasoline hydrocarbons) produced in this country was 78,000 bbl. daily; production of crude petroleum was 4,500,000 bbl. daily.

Most important of all petro-chemicals, of course, is high-octane aviation gasoline, essentially a blend of synthetic organic chemicals. Production of 100-octane aviation gasoline in early 1942 was at the rate of 45,000 bbl. daily; it is now being turned out at a rate probably in excess of 600,000 bbl. daily.

Toluol, until 1939 produced solely by the coal-tar industry, is now being supplied in large quantities by petroleum refineries, chiefly through isomerization of dimethylcyclopentane to methylcyclohexane and by hydroforming. The petroleum industry is now producing close to 75 percent of the nation's entire toluol output. Probably 90 percent of this product has been going into TNT.

Of the aviation fuel blending agents, cumene has probably received most attention. This chemical, which is isopropyl benzene, has accounted for probably 25 percent of our increased aviation fuel output during the year, yet high cost disfavors any appreciable postwar use of cumene as a fuel blending agent. Phosphoric acid is the usual catalyst used in the synthesis of cumene from benzol.

According to G. G. Oberfell of Phillips Petroleum Co., utilization of liquefied petroleum gas for chemical manufacturing increased about 5 billion gal. to reach a total of 60 billion gal. in 1944. Chemical sales represented 7.7 percent of total LPG utilization compared to 8.2 percent in 1943. These figures do not include normal butane or butenes used in production of butadiene. No estimate is included to cover natural isobutane or normal butane isomerized by catalytic processes to isobutane or C_3 and C_4 unsaturates produced by cracking and alkylated with isobutane for production of 100-octane aviation fuel.

The synthetic rubber program, producing buna and butyl from petroleum hydrocarbons at the rate of 350,000 tons yearly, thus requires an estimated 765,000 gal. daily of C_4 hydrocarbons.

One of the largest hydrocarbon chemical plants in the country was under construction during 1944 in the Gulf area. It has been stated that this plant will consume about 80,000 gal. per day of propane-butane gases. During December it was announced that American Cyanamid Co. and the Texas Co. had formed an agreement whereby the two would cooperate in the production of organic chemicals from petroleum constituents.

Triptane, which is 2, 2, 3-trimethylbutane, is now in experimental production. This chemical, when blended with TEL probably the most powerful aviation fuel known, is still very expensive and its large-scale production presents many technical difficulties. Other important chemicals produced from petroleum constituents during the year have been estimated as follows: 75,000,000 gal. of isopropyl alcohol; 12,000,000 gal. of ethylene glycol; 3,000,000 gal. of methanol; 10,000,000 gal. of methyl ethyl ketone; and about 25 percent of the country's supply of butanol.

Freon-12 or dichlorodifluoromethane has become a large-tonnage chemical within the past few years. Production for 1944 has been estimated at 20,000 tons, but facilities are now being installed that will increase this to the rate of 33,000 tons yearly. Freon plants are located at Deepwater, N. J. and E. Chicago, Ind.

Production of methyl formate, intermediate in the manufacture of methyl methacrylate resins and of sulfadiazine, is estimated to have reached the neighborhood of 10,000 tons annually.

(Latest available statistics for organics appear on p. 142 of this issue.)

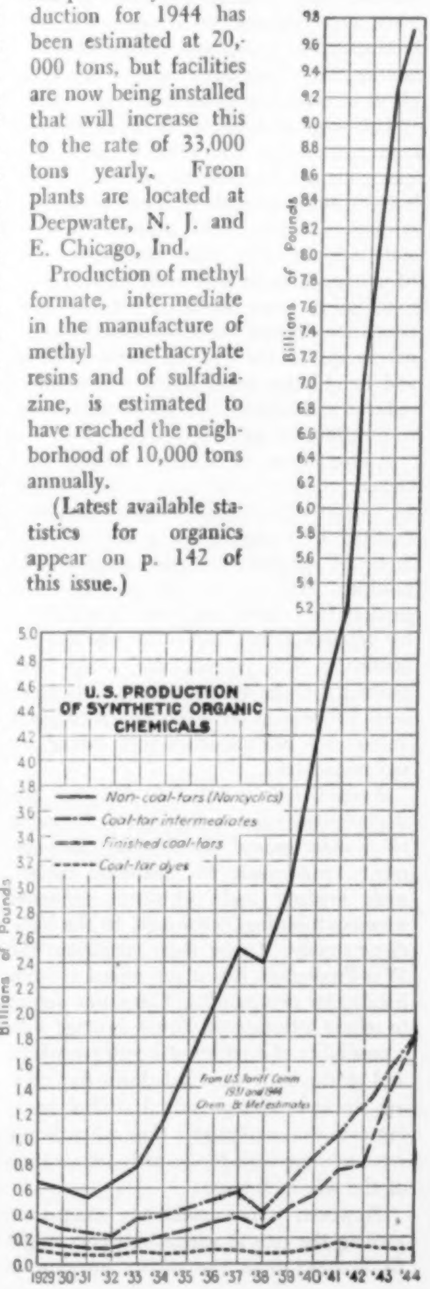


Table. I—U. S. Production of Specified Synthetic Organic Chemicals[1]

	1939	1940	1941	1942	1943
Acetaldehyde	....	201,484,831	179,516,000	224,445,142	....
Acetic acid (100%)	119,652,650	186,364,384	225,671,063	264,898,632	292,541,321
Acetone	....	201,506,334	....	....	336,000,000[3]
Acetylsalicylic acid	5,371,682	6,409,824	8,084,003	8,170,113	8,687,773
Butyl acetate, normal	....	....	....	67,024,658	64,319,086
Ethyl acetate (85%)	67,897,408	75,368,803	94,689,878	85,993,621	103,600,441
Ethyl ether	....	....	22,645,521	55,017,609	65,847,038
Formaldehyde (40%)	134,478,827	180,884,573	277,000,000[2]	485,000,000[3]	....
Hexamethylenetetramine	....	....	....	15,332,903	24,733,192
Hydroquinone, phot	1,441,329	1,288,647	1,883,611	3,005,688	2,658,656
Isopropyl alcohol	179,062,266	219,925,900	....	380,000,000[3]	....
Methyl chloride (100%)	3,021,078	3,041,661	4,911,360	4,557,597	11,451,086
Methyl salicylate	1,684,619	1,641,571	2,577,601	2,250,124	2,724,945
Oxalic acid	10,416,269	12,921,227	15,851,200	15,110,276	17,149,798
Plasticizers, non-coal-tar	6,031,548	8,474,052	12,118,032	25,032,829	49,724,215
Salicylic acid	4,259,675	5,068,010	5,326,080	4,131,483	5,124,133
Sulfa drugs, total	....	....	....	5,434,427	10,005,307

[1] From U. S. Tariff Commission. All figures are given in pounds.
[2] Approximated by *Chem. & Met.* for 1941. [3] Approximated by *Chem. & Met.* for 1943.

Table II—U. S. Production of Coal-Tar Synthetic Organic Chemicals[1]

	1937	1938	1939	1940	1941	1942	1943
Intermediates	575,893	401,943	607,175	805,807	1,006,564	1,230,965	1,533,513
Dyes	122,245	81,759	120,191	127,834	168,595	151,878	144,013
Color lakes and toners	18,041	14,407	18,154	19,213	26,278	17,176	16,313
Medicinals	14,800	11,097	15,188	18,214	29,775	35,318	49,493
Flavors and perfumes	4,356	3,837	5,349	5,485	9,931	7,947	8,120
Rubber chemicals	29,202	18,771	29,966	37,139	40,575	34,235	58,492
Miscellaneous	42,395	39,593	69,681	92,023	155,069	227,809	328,245

[1] As thousands of pounds. Data from U. S. Tariff Commission.

ALCOHOL AND SOLVENTS

While petroleum plants have increased facilities for production of butadiene, the necessity for larger outputs of high-octane gasoline has diverted butylenes in large volume to refineries and compelled alcohol producers to continue to fill the bulk of butadiene needs.

PRODUCTION and distribution of ethyl alcohol last year ran very much in accord with a prearranged program. Consuming requirements had been reviewed and set at a specified level and a production program adopted, capable of supplying the estimated needs and of maintaining an ample stockpile. As virtually the entire supply of alcohol was purchased by the Defense Supplies Corp., distribution problems were reduced to a minimum and producers were concerned mainly with obtaining raw materials enough to keep plants as close as possible to full operation.

The original estimate for 1944 alcohol requirements was 632,000,000 gal. This was made up, in terms of millions of gallons, of direct military 48, Lend-Lease, 59; synthetic rubber, 328; indirect military and civilian, 165, and anti-freeze, 32. Minor adjustments were made in the group totals as the year advanced but the final tabulation differed but little from the original except in the case of direct military and Lend-Lease needs which were sharply reduced and brought the grand total down to 609,000,000 gal.

A breakdown of indirect military and civilian requirements with a distribution of about 160,000,000 gal. involved, credited 24.4 percent for protective coatings; 14 percent for photographic and printing; 12.8 percent for plastics; 12.6 percent for textiles and dyes; 11.8 percent for tetraethyl lead and other gasoline ingredients; 7.5 percent for drugs and pharmaceuticals; 4.6 percent for food products; 3.6 percent for explosives; with small orders and miscellaneous uses taking up the remainder.

Around the middle of the year the alcohol situation was regarded as favorable for a wider general distribution. Requirements, particularly for synthetic rubber, were lowered and petroleum refineries were contributing increasingly to the butadiene supply. Under these conditions the War Production Board authorized a liquor holiday for two months. This action served to relieve a threatened liquor shortage with a possibility of a return of bootleg markets, and at the same time cut down the existing stockpile of high priced alcohol hanging over the market at a time when hopes were running high for an early termination of the war in Europe.

However, some uncertainty existed regarding the rate at which butylenes might be diverted from the rubber program to increase production of aviation gasoline. But stockpiles of alcohol continued to increase and, late in the year, requirements for the synthetic rubber program for 1945 were reduced by about 100,000,000 gal. under the 1944 figure. This influenced the release of about 2,000,000 gal. of alcohol for non-beverage civilian use to supplement the regular fourth quarter allocations. This optimistic view soon was dispelled by the demand for a speeding up in the rubber and aviation gasoline programs. Estimated requirements for alcohol in 1945 were moved up to 655,000,000 gal. As carry-over stocks amounted to 81,000,000 gal. and 1945 production is set at 603,000,000 gal. the probable supply is larger than the estimated requirements.

Early in the year it had been anticipated that larger supplies of molasses would be made available to fermenters. But negotiations looking toward that end did not materialize and the Cuban government was able to sell its entire sugar crop to the United States at a high price. Restrictions were placed on the importation of Cuban rum and gin with the result that distillers in that country were able to persuade their government to utilize domestic distilling capacity to produce ethyl alcohol for motor fuel. The outcome was that a large quantity of molasses which had normally been exported to the United States was consumed on the island. This not only had an immediate effect in cutting down our supply of molasses but also may become significant in the postwar period. As we had sufficient grain on hand, over-all alcohol production did not suffer but in certain areas outputs were restricted as many plants were not equipped to grind grain.

Alcohol producers maintain that enough sugar is available to release a sufficient amount to plants which do not have grain grinding facilities. The sugar shortage resulted from the failure of the beet sugar growers to reach their quota, and scarcity of ship bottoms from Cuba restricted shipping surplus quantities. Rumors are now current that the British government which formerly obtained its molasses in the East Indies and India, was in the market for part of the Cuban crop. If this materializes, fermentation alcohol may be high priced for some time after the German phase of the war is completed.

Domestic production of synthetic alcohol is now over 60 percent of prewar consumption. This creates a dilemma for the fermentation producers as undoubtedly raw materials for fermentation alcohol will be high for several years after the war and fermentation production either will have to meet low-priced competition or restrict production. High construction costs will be an obstacle to conversion to the synthetic process and at the same time there always is the possibility that farm products may be depressed and low priced raw materials made available for fermentation.

METHANOL

Production of methanol has expanded steadily throughout the war period but this has resulted solely from enlarged output of synthetic. The natural product has dropped in volume ever since 1941. Last year production of natural was below what had been established as a requirement level. The main factor in holding down production was the shortage of manpower which reduced the wood supply. Price ceilings also were not favorable for increasing plant operations and total natural methanol made available was nearly 14 percent below the 1943 figure and more than 40 percent below the 1941 total.

While activities of synthetic plants varied considerably from month to month, influenced by increases or contractions in the demand for ammonia, the net result was a continuance of the upward trend with a gain in volume of about 10 percent over 1943 and about 30 percent over 1941. Early in the year military requirements for ammonia were curtailed and ordnance plants became self sustaining. This left larger amounts for commercial plants and production of methanol was stepped up to a point where it exceeded consuming needs. The limited storage facilities soon were overtaxed and about 10 percent of total production was allocated for use in the anti-freeze trade.

However, before marketers of anti-freeze were able to package their allotments they were under pressure to produce more

Ethyl Alcohol Requirements By Major Groupings, 1942-1945

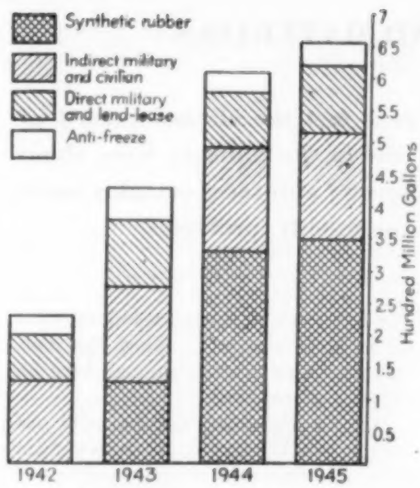
	1942		1943		1944		1945	
	Million Gal.	Percent	Million Gal.	Percent	Million Gal.	Percent	Million Gal.	Percent
Direct military and Lend-Lease	71.2	31.06	102.9	24.06	87.0	14.29	105.0	16.03
Synthetic rubber	.....	.....	126.0	29.47	330.0	54.19	349.0	53.28
Indirect military and civilian	128.0	55.85	147.9	34.59	161.0	26.43	165.0	25.19
Anti-freeze	30.0	13.09	50.8	11.88	31.0	5.09	36.0	5.50
Total	229.2	100.0	427.6	100.0	609.0	100.0	655.0	100.0

ammonia as a result of the increased fertilizer demand which came out of the International Agricultural Conference. Before the agricultural demands were fulfilled a decided change in the global military situation created a demand for explosives so that synthetic methanol which was easy in March and April became very tight during the late summer and at the end of the year it was a critical item.

ISOPROPYL ALCOHOL

New facilities for producing isopropyl alcohol were completed during the year. These, in addition to large production from existing plants, were able to turn out approximately 80,000,000 gal. during the period. As is always the case, a large part of this output was converted into acetone and other chemicals. Of the remaining quantity, 8,000,000 gal. were allocated to anti-freeze which resulted in a sharp curtailment of the amount of isopropyl available for civilian uses. In the coming year, isopropyl undoubtedly will be in an easier position as most of the gallonage allotted to anti-freeze last year may be made available for civilian purposes. Undoubtedly methanol will not be used in the anti-freeze state to any large extent and acetone production is now operating at capacity which means that it will not require more isopropyl than it did in 1944.

The largest part of normal butyl alcohol is produced by fermentation. The output throughout the year has been going into military channels and Lend-Lease and



Requirements for Alcohol

practically none was available for civilian use. This was true to a greater degree at the end of the year than it was in the beginning and as no expansion has been made in normal butyl facilities, it is expected that the market will be tight as long as the European war continues.

As was the case in 1943, butyl alcohol producers had difficulty in obtaining raw materials at prices which would allow them to produce at OPA ceiling prices and several adjustments were made during the year to compensate for the varying production costs. Synthetic butyl alcohol was diverted into military channels and practically none was available to civilians. With normal butyl acetate in short supply, secondary butyl acetate was in large demand. As has been the case for the past few years, production was limited as the greater part of secondary butyl alcohol production was diverted to the manufacture of methyl ethyl ketone.

For the third successive year, producers of methyl ethyl ketone operated at capacity with the 1944 output the largest yet attained. About 70 percent of the total supply went into direct and indirect military needs, leaving very little for ordinary industrial uses.

ACETONE

While production of acetone last year was of record proportions, producers were beset with a number of difficulties of varying nature. At one time production of fermentation acetone was curtailed as a result of the liquor holiday. Another month synthetic producers had operating difficulties and thereby cut down their output. At another time Lease-Lend demands were much higher than were originally anticipated and caused a switch in the allotment of available stocks. The latest difficulty is due to the fact that as a result of the textile shortage acetone is in demand as a solvent for cellulose acetate which in itself is under heavy pressure. It is expected that during 1945 the unprecedented production of 380,000,000 lb. will not be too much for the demand.

GLYCERINE

Early last year, the Fats and Oils Branch of the War Food Administration made a comprehensive study of domestic disappearance, consumption, shipments, and allocations of glycerine and also gave data for consumption by, or allocations to, the principal consuming industries. These data will be found in the accompanying table. Late in the year this was supplemented by a further breakdown of the miscellaneous uses in 1941 and 1942. Among the largest of these uses in 1941 were: cleaning materials, including soap, synthetic detergents, wetting agents, polishes, and dressings, 1,589,000 lb.; manufacture of chemicals, 1,408,000 lb.; insect and microorganism control, 187,000 lb.; embalming fluids, 146,000 lb.; hydraulic fluids, 140,000 lb.; lubricants, 107,000 lb.; and cement compounds, 103,000 lb.

Any statistical review of the glycerine market for the last few years must necessarily be incomplete because import and export figures are withheld and distribution totals do not include the amounts of direct purchases for military account. However, production of crude glycerine was of record proportions last year with an outturn of about 200,000,000 lb. which topped the previous high of 195,283,000 lb. made in 1941. Production of CP

(Continued on page 141)

Apparent Domestic Disappearance, Consumption, Shipments, and Allocations of Glycerine, 1940-44

(Thousands of Pounds)

	1940	1941	1942	1943	1944
	Disappearance, consumption or shipments				
Apparent domestic disappearance[1]	151,805	206,578	153,369	131,561	....
Total quantity specifically allocated under FDO-34	....	....	....	161,347	....
Consumption or shipments[2]	140,359	175,135	166,350	182,931	199,150
Small orders and resale[3]	14,309	18,022	7,755	9,775	
Shipments against specific allocations[4]	....	....	....	123,156	
	Consumption and allocations by class of use				
	Reported consumption			Allocations	Est. consumption
Drugs and pharmaceuticals	8,885	10,874	9,304	9,798	10,750
Dynamite and nitroglycerine	22,586	30,624	36,445	40,917	40,000
Synthetic resins and ester gum	27,723	40,234	41,863	52,488	45,000
Rubber processing	1,397	1,802	1,200	1,500	1,500
Gaskets and cork products	6,030	8,019	8,638	8,372	10,000
Cellulose films and meat casings	18,483	18,973	15,946	11,901	19,000
Glassine, greaseproof and vegetable parchment	1,598	2,008	1,511	2,765	3,000
Printers' rollers and supplies	4,256	5,047	5,169	4,445	5,000
Textile processing	2,321	2,827	1,928	2,242	2,500
Leather products	371	472	513	558	400
Adhesives	2,453	2,871	2,304	2,170	2,500
Paper other than glassine and greaseproof	1,056	1,540	1,510	1,814	1,500
Beverages, flavors, candy and gum	1,998	2,411	1,329	306	2,000
Margarine, shortening and other edibles	3,279	4,050	2,904	1,243	6,000
Tobacco	24,833	25,793	20,071	7,652	32,000
Dentifrices and toilet articles	9,204	11,313	7,567	2,823	10,000
Miscellaneous	3,886	6,268	7,948	10,353	8,000
Total	140,359	175,135	166,350	161,347	199,150

Disappearance and shipments on 100 percent basis. Consumption and allocations uncorrected for grade; figures represent approximately 97.5 percent glycerine. [1] Computed from Department of Commerce reports on production, trade, and stocks. [2] 1940-42, consumption reported by 1,234 users on War Production Board form PD-361; probably represents more than 95 percent of total consumption. 1943, shipments reported by producers and refiners on form FDO-34-1. [3] 1943, small orders reported on form FDO-34-1; other years, resale reported on form PD-361. [4] Reported by producers and refiners on form FDO-34-1.

FERTILIZERS AND MATERIALS

Fertilizer production for use last year met the all-time record of 1943 but complications and confusion in the industry were about the worst ever experienced. This industry still faces complex international, inter-industry, and inter-commodity problems.

Any review or forecast on fertilizer or fertilizer materials must take account of the constant shifting of supplies caused by war, and the consequent changes in both manufacturing and marketing. Almost every major policy formulated by the industry, or forced on it by war conditions or government action, has been subject during the past year to frequent and violent change. There is every prospect that 1945 will bring an equally complex and difficult period with respect to the three major raw materials—phosphate, potash, and nitrogen—as well as for the end products, superphosphate and mixed fertilizer. About the only safe generalization for 1944 and 1945 is the trite phrase "The only constant thing is change."

VIOLENT SUPPLY SWINGS

During 1944 the fertilizer industry has been subjected to the most violent swings in material supply that it has ever experienced. The news columns of *Chem. & Met.* have reported many of these in some detail as they have occurred.

During the early stages of the war, the development of phosphate rock, sulphuric acid, and potash supplies went on without too much difficulty. There were shortages here and there for short periods. But at no time was the supply of nitrogen adequate to meet military, industrial, and fertilizer needs.

Then came 1944. Early in the year the synthetic industry provided for the first time a generous supply of ammonia. Before midyear the big problem confronting WPB and industry executives appeared to be how to get rid of the surplus. Some ammonia capacity was changed over to the production of methanol. Several new plants were reduced in size or cancelled, even one or two on which actual construction was well along. The only new capacity which was allowed to go on to completion was that which appeared to be essentially privately owned, like the DPC plant at Lake Charles, La.

In the summer of 1944 it appeared that there was available in the United States capacity to make at least 1,000, perhaps 1,500, tons per day of synthetic ammonia for which there was no immediate need, or even available market. A cut back in production plans occurred. Then the expectation of winning the European conflict in the late fall or early winter vanished. The huge scale of European military operations became evident. Then the problem was to get enough ammonia even for the most urgent needs.

It is a legitimate question still unanswered in Washington as to how many more of these violent swings of scarcity and surplus may be expected before the end of both European and Pacific hostilities and readjustment for the postwar has taken place. Even the more optimistic expect a repetition of some of these troubles.

INTERNATIONAL ROCK PROBLEMS

Domestic fertilizer manufacture has required all of the phosphate rock which the industries of Florida and Tennessee could supply. In fact there have been a few cases in which the quantity of rock delivered to the fertilizer plant determined the quantity of fertilizer which could be made. If there had been enough sulphuric acid and other raw materials for fertilizer manufacture there surely would have been a serious shortage of phosphate rock in most important fertilizer-making areas.

Under these circumstances the rock producers have done considerable development work and been able to stabilize mining and benefication operations. They have not missed the export market, which used to be a major factor in the sale of rock. But these producers are wise enough to realize now that fertilizer production and consumption are not likely to continue indefinitely after the war on the present high level of demand. They are therefore deeply concerned with the reports from abroad regarding the phosphate rock situation in competitive areas, especially North Africa. They know that European phosphate users will take African rock, rather than resume the purchase of Florida rock, to the maximum practical degree when hostilities have ended.

Scarcity of phosphate in central Europe has probably been one of Germany's most serious handicaps during the last year or two. The Nazis expected to get plenty of phosphate from North Africa when they had control of the Mediterranean and of most of the north coast of the Dark Continent. They were disappointed because when the British and French lost control they very effectively destroyed many of the production, transport, and port facilities essential for shipping rock to Europe. The Germans succeeded in re-establishing many of these facilities and were just beginning to get wanted quantities for fertilizer when the tide of battle turned at El Alamein; they in turn destroyed the facilities again before the British got control. Thus central Europe was left without phosphate in the quantities needed for satisfactory crop production.

Some economists have argued that this series of facts indicates one of the most potent ways in which the Axis countries might be controlled in postwar years. The theory is that the quantity of phosphate which they might be allowed to have could determine the extent of their farm and food production. If so, it is argued, the potency of these nations for war preparation could also be limited. It is an interesting idea, though probably only a small piece of any effective postwar program for technologic control of belligerent nations.

TENNESSEE WORRIES

The large demand for phosphate rock in the United States has caused some in Tennessee to worry least the state's supplies be exhausted at a relative early date. This idea has taken such hold that there has been advocated by some extremists the enactment of legislation by the Tennessee legislature to restrict the use of phosphate rock from that state. It seems unlikely that such drastic legislation will be enacted at an early date. But the tendency of that state has been indirectly to restrict activities, so as to have the same effect. Important among the restrictions that make Tennessee rock less desirable for the user are new elements of cost, such as regulation of strip mining and the imposition of new severance taxes.

The Tennessee situation has been so over-emphasized by a few as to imply that the United States might soon suffer a shortage of phosphate. Obviously there is no danger of that for a long time to come. But it is not at all unlikely that within a few years it may be necessary to begin more extensive commercial development of the phosphate deposits in Montana, Idaho and nearby areas. The major handicap in that development seems likely to be the greater cost for transport of the rock from remote points to the major areas of fertilizer use. The speed and extent of that development are almost certainly going to be determined principally by the extent to which foreign users of phosphate rock buy in this country rather than in North Africa or some other resource areas.

"GIVE AWAY" PLANS

A major factor for fertilizer consumption for several years past has been the program for soil conservation operated under Agricultural Adjustment Administration.

That agency was started for farm relief at a time when crop acreage curtailment was necessary, or some kind of aids to farmers were essential, lest all agricultural areas become financially impotent. AAA has continued recently in a somewhat different relationship.

A major program still continuing for improvement of soil conditions is the plan for assisting the individual farmer to use quantities of fertilizer beyond those which he had normally been able and willing to buy commercially. Last year, for example, farmers were assisted with some 12,000,000 tons of agricultural lime and with significant quantities of both superphosphate and mixed fertilizer.

Late in 1944 AAA twice asked for bids from the industry on quantities of a million or more tons of superphosphate. They received very small offerings because the industry prefers to sell its output commercially through normal channels, instead of furnishing it for Government "give away" distribution. The actual offerings were largely those of companies that expected to have small surpluses late in the Spring after they had cared for their regular trade. The present prospect is that there will not be even those small surpluses available.

This combination of circumstances again spotlights the difference between the stated policy and the actual practice of Triple-A. The stated policy of this agency is to offer for soil conservation purposes only fertilizer or superphosphate for which there is no commercial demand. As indicated, the actual effort and the practice is to get much larger quantities and to continue extensive distribution as a part of the farm-subsidy program of the Department of Agriculture.

There is likely to be a real showdown on this question before long. The administration is expected to support continued subsidy distribution. The question will be whether Congress will be willing to continue to finance that plan, a question that will probably be answered in accordance with the more vocal wishes of the big farm organizations, one of the potent legislative factors in Washington.

Some observers think that by the time this issue becomes acute there will be plenty of desire in the fertilizer industry itself to have this market remain open to the industry.

PHOSPHATE PROSPECTS

Estimates of phosphate supply for fertilizers during 1945 depend upon who is making them and the general assumptions used as a basis. The supply will obviously be limited by the available sulphuric acid for manufacture. The latest estimates on that subject indicate production of about 5 million tons of superphosphate, calculated on the 18 percent equivalent basis. All of the supply will undoubtedly be purchased and used except small quantities that may be caught by transportation difficulties.

The vast majority of the superphosphate made and used will continue to be of the normal concentration, that is a product containing about 18 to 20 percent of available phosphoric acid. Certainly less than 5 percent of the total production will be a concentrated superphosphate, which usually has about 45 percent of available phosphoric acid. Incidentally, this concentrated product is now called "double superphosphate." Formerly it was commonly called "triple superphosphate" because the normal grade used to contain only about ⅓ as much of the available plant food.

It is expected that with the ending of European hostilities there will be an an abundance of raw materials. Certainly there are ample plant facilities and distribution agencies to carry on all the business for which there may be demand. After the crop year of 1945 the business in superphosphate of the United States will therefore probably be determined by the crop goals set by the government more than by any other single factor. This will represent a change because formerly the farmer's ability to buy, that is his cash or credit position, was more important than it seems likely to be in the postwar period.

INTERNATIONAL POTASH

Domestic producers of potash have continued to expand productive facilities in California and New Mexico. Despite wartime difficulties and delays there has been a substantial increase in the total capacity during the past year. This includes both facilities for mining and more particularly facilities for preparation of marketable grades of chloride and sulphate in the chemical refineries which exist at these mining points.

These enterprises will certainly be largely influenced in the postwar period by the government policy with respect to potash imports. There are a dozen proposals ranging from actual embargo or prohibitive tariffs through to mild forms of quota control of imports. Whether Congress will consider any of these seriously, or the present administration permit them, can not now be even guessed.

There is no doubt that there are half a dozen foreign areas where potash can be produced and brought to the United States at reasonable prices. The price would be in each case largely a matter of policy of the local government. These prices need not be fixed solely on costs because there is no common denominator for measuring costs in the Soviet, Polish, Spanish and British-controlled Palestine operations. Those sources will be seeking any outlets. The United States with plenty of money will be an attractive market. The long-term plans for potash will be largely determined ultimately by political decisions made in or for such producing areas abroad.

WANTED: DOLLARS!

Postwar plans of many divisions of fertilizer and fertilizer materials will be determined by control of international finance. This fact is evident from the part of the discussion above which relates phosphate rock and potash. In judging such factors there is one very important consideration that must be taken into account.

Other nations will want from the United States, almost without exception, more capital goods and more machinery and equipment than they will readily be able to pay for. In some cases they will need these things so badly that they will be willing to make almost any sacrifice in order to get them in order that rehabilitation will go on promptly in their countries. The important consideration of international arrangements will be, therefore, the getting of dollar credits.

The extent to which any producer of potash or other material sent to the United States is able to arrange for that shipment to this country will determine the extent of that trade. Many nations will feel that they would rather give us at actual cost, or ship at "dumping" prices, such things as potash in order to get credit here. They will consider it a profitable transaction to trade such minerals for machinery or automobiles or other things that they need from us. It is this situation which makes almost impossible now any forecasts at to how some of the basic international relations in major fertilizer materials may work out.

And, incidentally, these considerations may very largely cover the supply of Chilean nitrate which we surely will not need, as well as the plans for phosphate rock and potash chemicals. It is not expected that mixed fertilizer or phosphate will move even under these influences to any very great extent. Only neighbor countries in the Western Hemisphere are likely to be customers. We need not anticipate either import or even threat of import.

Deliveries of Agricultural Potash Salts of American Origin June-May 1943-44*

(Tons of K_2O)

	United States	Export†	Total
60% Muriate	434,012.89	50,359.70	484,372.59
50% Muriate	51,444.50	2,487.00	53,931.50
Manure salts	60,064.60	3,643.28	63,707.88
Sulphates	47,824.14	5,033.15	52,857.29
Total..........	593,346.13	61,523.13	654,869.26

* Source: The American Potash Institute. † Canada, Cuba, Puerto Rico and Hawaii.

PLASTIC MATERIALS

The history of plastics for 1944 is a mixture of various trends. Vinyl resins and ethyl cellulose made substantial gains as a result of a plant construction program. Other plastics were retarded by shortages of such raw materials as formaldehyde and synthetic camphor. It is estimated that the total output on an "as sold basis" reached the all-time high of 700 million pounds.

Cellulose acetate and butyrate production reached a total of about 65 million pounds in 1944 which is an increase of about 10 percent over the previous year. This increase was accomplished notwithstanding shortages of acetic anhydride, linters, and plasticizers. The tight situation in phthalate plasticizer had a serious influence on the production of acetate in sheet form. While much of these materials were used for civilian applications the armed forces demands increased in the fall. Prices of the molding powder dropped about 10 percent over the previous year.

CELLULOSE NITRATE

Cellulose nitrate sheets, rods and tubes produced last year were in the neighborhood of 15 million pounds. Another 45 million pounds of nitrate were consumed in lacquers, film, and other applications. In 1943, approximately 14 million pounds of molding material were produced. Near the end of the year production decreased due to a shortage of the plasticizer, synthetic camphor. The camphor is going abroad under Lend Lease for war purposes. Much of this cellulose plastic is being consumed in war applications, but some has been available for civilian requirements. Prices were stable.

Ethyl cellulose is one of the few plastics that has made considerable progress recently. Manufacturing facilities have been expanded with the resulting increase from about four to eight or nine million pounds last year. About 60 percent is consumed for molding and extrusion, the remainder goes into removable protective coatings, lacquers, adhesives, and film. While some little has been available for civilian purposes, it is anticipated that military demands may take the entire output. Price of the molding powder declined about 2c. per lb.

In 1943, it has been reported by U. S. Tariff Commission that 53,859,000 lb. of urea resins were produced of which 32,546,000 lb. were used in adhesives, 4,857,000 in protective coatings, and the balance in miscellaneous applications. Last year's production was not appreciably higher. One authority estimates the amount consumed in adhesives and textiles at 40,000,000 lb., in molding powder at 15,000,000 lb., and in protective coatings at 5,000,000 lb. These figures include melamine resins. This resin was rather plentiful during much of the year, but near the end was handicapped by shortages of formaldehyde and manpower. Urea molding powder prices showed a slight decline during the year. They are now sold on a delivered basis. Also, there was a price decline in the urea adhesives.

The melamine resins showed some increase in 1944, but are still produced in relatively limited volume. The principal development has been the extensive use of these resins for imparting wet strength to paper for bags, maps, and blue prints. Also there has been increased use in treatment of textiles for such purposes as shrinkproofing, water repellency and stiffening. Larger volumes of the melamines were used for electrical insulation. Prices have been stable.

With the completion of several new phenol plants in 1943, the phenolic resin producers looked forward to a big year in 1944. In this they were considerably disappointed as a result of the shortage of benzol for production of phenol, and a shortage of formaldehyde. Strict Army requirements and manpower shortage also had their influence. In the final quarter of the year formaldehyde became short due to scarcity of methanol. Several methanol plants were converted to ammonia. And several phenol plants were closed due to the shortage of benzol.

PHENOLIC RESINS

Notwithstanding these serious handicaps, there was an increase in the amount of phenolic resins produced last year over 1943. About 150,000,000 lb. total was the figure for 1944. Of this amount 60,000,000 lb. was molding resin (net resin content). The balance, 90,000,000 lb. (net resin content), was for resins for use in plywood, adhesives, brake linings, abrasive binders, etc. The U. S. Tariff Commission reported a total production of phenolics in 1943 at 144,541,000 lb. (net resin content) which was derived as follows: moldings, 61,424,000 lb., castings, 2,838,000 lb., laminating, 23,118,000 lb., protective coatings, 15,519,000 lb., adhesives, 10,290,000 lb. and miscellaneous other uses for straight phenolics, 11,527,000 lb. The balance represents mixed phenolics, cresol and cresylic acid resins.

Polystyrene production has not materially changed since 1943 when 6,700,000 lb. were made. It has been stated that the capacity of the present plants is in the neighborhood of 12 million pounds annually, but that the demand for styrene by the synthetic rubber industry holds down the output. During the year announcement was made of new styrene copolymer resins with much higher heat distortion points than polystyrene. Polydichlorostyrene is said to have a heat distortion point of 236 deg. F. Another recent development is styrene resin fibers for thermal insulation and as a substitute for kapok.

Vinyl resin production probably expanded more in 1944 than any other synthetic resin. Production facilities were greatly increased. The 1943 production was estimated by *Chem. & Met.* as having been about 100,000,000 lb. While it is difficult to get production figures for the group of resins the total for 1944 is probably in the neighborhood of 175,000,000 lb. (including solvents, etc.) Probably over one-half this figure represents the vinyl chloride output, which has been in large demand by the armed forces.

The already large number of uses for the vinyl resins was further increased during the past year. However, such applications as electrical insulation for wire and fabrics remain among the most important. Unlike most synthetic resins their present use as a molding material is comparatively less important.

NEW DEVELOPMENTS

Several months ago a new series of vinyl vinylidene chloride copolymers was announced. The applications are for electrical equipment; extruded tubing; gaskets, coated fabrics, and paper; and automobile parts.

A year ago the 1943 production of acrylic resins was estimated at 32,000,000 lb. About 3,000,000 to 4,000,000 lb. more were made last year than in the previous 12 months. A shortage of metallic sodium was the principal factor in holding down the output of these resins.

Polyethylene resins were announced by two manufacturers early in the year. The most interesting properties are the dielectric characteristics and water resistance. The volume produced thus far has been comparatively small.

Several other developments were announced during the year. In October a plant was completed for the manufacture of organo-silicon oxide resins. As yet the production is on a small scale. There is a wide variety of application ranging from chemically-resistant grease, and electric insulating resins to high-temperature lubricants.

RAYON AND SYNTHETIC FIBERS

With almost monotonous regularity rayon continues each year to surpass all previous records. In 1944 total output of the cellulose-based synthetics exceeded the preceding year by 9.2 percent which was due mainly, however, to the large increase in tire yarns.

In its palmiest days, in 1929 and thereabouts, the consumption of silk in the United States never exceeded much more than one-tenth the usage of rayon in that year of shortages, 1944. Since Pearl Harbor day, rayon has had to take over most of the job of silk, carry its own load, and shoulder also the load of many new jobs that never previously belonged to any textile fiber. It is interesting, if not particularly useful, to speculate where rayon might have gone in 1944 if materials and manpower shortages had not held it back. With more than 9 percent greater rayon output than ever before, there was only a nominal increase in rayon for ordinary civilian purposes.

As a matter of fact, almost none of the increase in yarns for the last two years has been in civilian types. The tire cord program, calling for an eventual 240,000,000-lb. capacity, was up to about a 70 percent rate at the year end and is scheduled for 100 percent by the middle of 1945. It accounted for the bulk of the new capacity. Rayon for other materiel and apparel uses of the armed forces continues high although there was slightly more rayon available for the free uses than in 1943, owing to decreases in some of the military programs. With the Western Front disappointments of late 1944, however, Rayon Organon, official statistical reporter of the industry, noted that this trend would probably be reversed at least during the earlier part of 1945.

As usual in our statistical analysis of the rayon producing industry we have drawn freely from the totals assembled by Rayon Organon. This agency, having 100 percent coverage of the industry, reports that 1944 overall production totalled 723,900,000 lb., of which 555,217,000 lb. was filament yarns, while 168,740,000 lb. was staple rayon. The comparable figures for 1943 are 501,125,000 lb. and 162,019,000 lb. For prewar comparison, 1939 data were, respectively, 328,625,000 lb. and 51,314,000 lb. Of the total, over 115,000,000 lb. of 1944 yarn was of the high tenacity tire cord type, essential for heavy duty civilian and military tires which contain considerable synthetic rubber.

The Organon states that the yarn total was broken down into 383,511,000 lb. of viscose plus cuprammonium rayon (of which we estimate 15,000,000 lb. was cupra), and 171,706,000 lb. of acetate yarn. Thus viscose plus cupra has increased from its 1941 position when it accounted for 63.7 percent of the total, to 69.1 percent in 1944. Acetate production would have been greater except for materials shortages during the year, as in 1943. Still, the 1943 recession in acetate has been broken, as will be noted from our chart of yearly breakdown by rayon types, and the 1944 figure exceeds by a small margin of less than 2 percent its previous peak year of 1942. Its margin over 1943 was about 5 percent.

Rayon Production and Imports, 1,000-Lb. Units

	U. S. Production	U. S.[3] Import Balance	World Production
1921.....	18,000[1]	3,276	65,000[1]
1922.....	26,000[1]	2,116	80,000[1]
1923.....	35,000[1]	3,029	97,000[1]
1924.....	38,750[1]	1,954	141,000[1]
1925.....	52,200[1]	5,293	185,000[1]
1926.....	62,575[1]	8,945	219,000[1]
1927.....	75,050[1]	14,633	267,000[1]
1928.....	97,700[1]	11,948	345,000[1]
1929.....	121,399[2]	14,832	404,000[1]
1930.....	127,333[2]	5,995	417,000[1]
1931.....	150,879[2]	1,490	470,000[1]
1932.....	134,670[2]	−456	509,000[1]
1933.....	213,498[2]	−176	660,000[1]
1934.....	208,321[2]	−2,432	799,589[1]
1935.....	257,557[2]	−2,193	932,780[1]
1936.....	277,626[2]	−1,558	1,022,000[2]
1937.....	321,681[2]	−525	1,199,000[2]
1938.....	257,916[2]	−1,195	990,000[2]
1939.....	331,200[2]	−1,703	1,145,400[2]
1940.....	390,072[2]	−1,440	1,143,960[2]
1941.....	451,204[2]	[3]	[3]
1942.....	479,330[2]	[3]	1,447,200[2]
1943.....	501,125[2]	[3]	[3]
1944.....	555,217[2]	[3]	[3]

[1] From *Textile World* except as noted; does not include staple.

[2] From *Rayon Organon*. Does not include staple which is estimated at 850,000 lb. in 1930; 880,000 lb. in 1931; 1,100,000 lb. in 1932; 2,100,000 lb. in 1933; 2,200,000 lb. in 1934; 4,600,000 lb. in 1935; 12,300,000 lb. in 1936; 20,244,000 lb. in 1937; 29,861,000 lb. in 1938; 51, 800,000 lb. in 1939; 81,098,000 lb. in 1940; 122,026,000 lb. in 1941; 153,285,000 lb. in 1942; 162,019,000 lb. in 1943; and 168,740,000 lb. in 1944.

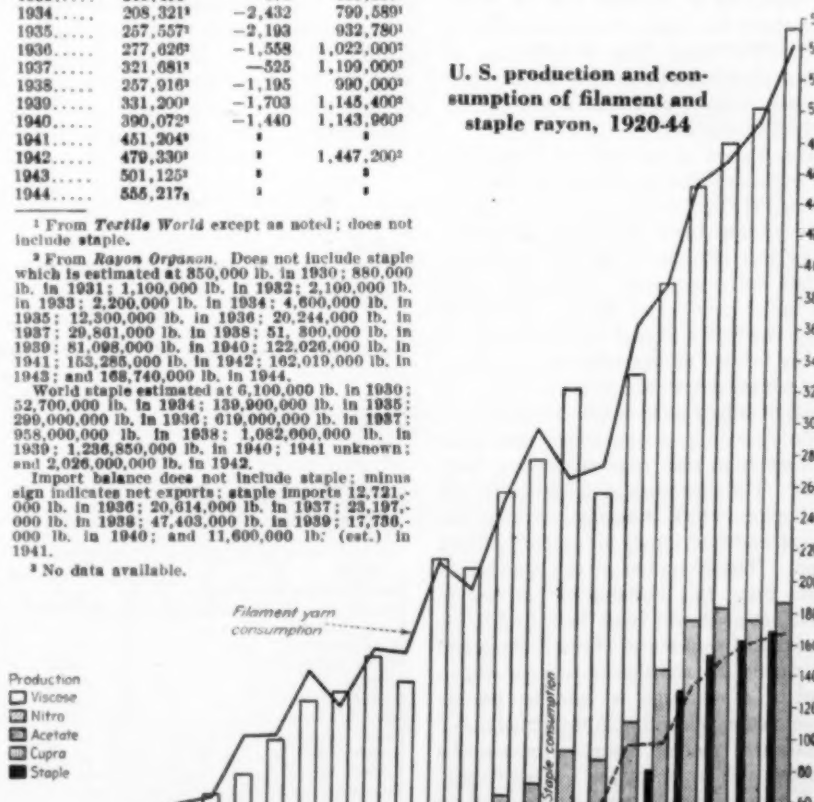
World staple estimated at 6,100,000 lb. in 1930; 52,700,000 lb. in 1934; 139,900,000 lb. in 1935; 299,000,000 lb. in 1936; 619,000,000 lb. in 1937; 958,000,000 lb. in 1938; 1,082,000,000 lb. in 1939; 1,236,850,000 lb. in 1940; 1941 unknown; and 2,026,000,000 lb. in 1942.

Import balance does not include staple; minus sign indicates net exports; staple imports 12,721,000 lb. in 1936; 20,614,000 lb. in 1937; 23,197,000 lb. in 1938; 47,403,000 lb. in 1939; 17,736,000 lb. in 1940; and 11,600,000 lb. (est.) in 1941.

[3] No data available.

Except for exports, on which data have not been released since our entry into the War, consumption trends in rayon closely paralleled production. There was no stock change in the case of filament yarns, and a negligible change for staple. The Organon places apparent consumption of filament yarns at 539,031,000 lb., with staple consumption at 165,710,000 lb.

This report has not concerned itself so far with synthetic fibers other than those derived from cellulose. This is not to say that other yarns of true synthetic character have not made considerable progress, as was discussed in detail in the *Chem. & Met.* report which appeared on pages 119-126 of our January 1945 issue. Nylon is, by a large margin, the tonnage leader of the non-cellulose synthetics, with an additional plant scheduled for immediate postwar construction. Sharp postwar competition with nylon is expected from several quarters, notably from high tenacity and super-high tenacity viscose yarns, and from the vinyl polymers. Milk casein yarn, cheaper than wool, has risen in tonnage to a point where it is now believed to be not for behind cuprammonium. Soybean protein is in small-scale experimental production by Drackett Co., following Ford's pioneering work. Numerous plastics are being considered also for fiber uses.



U. S. production and consumption of filament and staple rayon, 1920-44

VEGETABLE OILS AND FATS

Production of oils and fats last year was about the same in volume as in 1943 with domestic outputs going far to make up for the loss in imports. The outlook, however, does not appear so favorable as a drop of about a billion pounds from the 1944 total is indicated.

While production figures for the final months may be subject to some revisions, the output of oils and fats last year will show up at approximately 10,900 million pounds which does not vary much from the grand total as reported for the preceding year but it does represent a moderate gain and may remain the record level for some years to come. The rise in output was due principally to lard and tallow as they were turned out in volume large enough to more than offset the drop in production of butter and vegetable oils.

Purchases of fats and oils by the War Food Administration, to which body control over oils and fats has been delegated, amounted to 1,310 million pounds which represented close to 10 percent of available supplies but it also represented a big drop from the 1,682 million pounds purchased in the preceding year. WFA buying of all types of fats was on a smaller scale and this was also true for oils with the exception of soybean, sales of which were about four and a half times those of 1943. The sharp drop in such sales of linseed oil was partly due to the fact that less was shipped to Russia where the oil is rated as edible.

The Bureau of Agricultural Economics has estimated that production of fats and oils in 1945 will drop more than a billion pounds below the 1944 figure. Practically all of this prospective decline is allotted to fats and greases with a moderate lowering in oil production despite anticipated sharp rise in the output of cottonseed oil.

Any forecast on vegetable oils must take into consideration, the possibility of a renewal of import trade in oils and oil-bearing materials with countries which have been shut off from such trade in the last three years. This has especial reference to the Philippines which normally has been our largest source of supply for coconut oil and copra. The liberation of the islands will again bring this business to life but to what extent it will come back in 1945 is a matter of conjecture. Even if copra and oil should be available in a large way, a scarcity of tonnage is sure to be encountered which will hold the actual movement to a modest figure. However the markets will be open, the sea lanes open, and it may be that transportation will be arranged more amply than now seems possible.

Ever since regular arrivals of tung oil from China were suspended, there has been a shifting about in the types of drying oils used in various manufacturing lines. The greater part of the burden has been placed on linseed oil and production of the latter has been maintained far above the normal levels. Last year crushers of linseed ran into difficulties the solution of which still lies ahead. To begin with there was a sharp drop in the domestic acreage sown to flax with a consequent falling off in the harvested crop. Then difficulty was found in placing charters for bringing in seed from the Argentine. Still later, vessels flying the American flag did not enter Argentine ports and in the closing months of last year no Argentine seed reached the Atlantic seaboard. While limited amounts of seed were received from Canada and Uruguay, the supply was far below requirements and crushing plants were forced to reduce operations and even to close entirely.

The seed supply for at least the first half of 1945 offers but little hope for improvement. The situation was further complicated by advices that the flax acreage in the American northwest would be still further reduced in the present year. This led to Congressional action authorizing the expenditure of $30,000,000 to stimulate increased production of flax. An acreage goal of 5,000,000 acres was set up with fixed quotas for each producing state and farmers will be paid $5 for each acre so planted up to his farm quota. Under this subsidy, the outlook for the coming crop has improved but it is too early to determine how it will result and even if the allotted acreage is attained there still are the growing hazards to be met before the final outturn will be assured.

Because military, export, and civilian demands for food products have been heavy in the last three years, distribution controls over oils have been directed toward cutting down industrial consumption of oil as much as possible where the oil could be converted into an edible grade.

Government agencies in studying requirements for inedible tallow and hard fats for 1944 found that these materials would be in ample supply for all war and civilian needs. They estimated total demands for inedible tallow and greases at about two billion pounds of which 1,289

Domestic Production of Tung Nuts, 1940-1944

State:	Unit	1940	1941	1942	1943	1944[2]
		Year of bloom[1]				
Georgia	tons	1,200	650	950	200	1,000
Florida	"	4,700	2,250	3,700	700	7,000
Alabama	"	200	350	500	100	1,500
Mississippi	"	3,700	3,700	7,200	1,940	13,000
Louisiana[3]	"	1,200	1,800	4,000	3,260	7,900
Total		11,000	8,750	16,350	6,200	30,400
Season average price to farmers, per ton	dollars	60.00	88.30	91.80	99.00	100.00
Estimated value of crop	1,000 dollars	660	773	1,501	614	3,040

[1] Tung nuts are harvested and delivered to mills late in the year of bloom and early in the following year, and usually are crushed in the first half of the year following the year of bloom. [2] Preliminary. [3] Including small quantities produced in Texas.

Indicated Production of Oils and Fats From Domestic Materials, 1940-1945

Million Pounds

	1940	1941	1942	1943	1944[1]	1945[2]
Butter: creamery	,837	1,872	1,764	1,674	1,490	......
Farm	403	395	366	340	320	......
Total	2,240	2,267	2,130	2,014	1,810	1,750
Lard and rendered pork fat:						
Inspected	1,527	1,526	1,724	2,080	......	......
Other	816	755	745	981	......	......
Total	2,343	2,281	2,469	3,061	3,250	2,400
Inedible tallow and grease	1,375	1,551	1,741	1,650	1,970	1,820
Edible tallow, oleostearine, oleo stock, and oleo oil	187	234	277	259	195	195
Neat's-foot oil	4	4	5	3	3	3
Wool grease	10	13	15	15	17	18
Marine animal oils	188	221	158	177	215	190
Corn oil	158	203	248	239	210	225
Cottonseed oil	1,274	1,392	1,366	1,313	1,133	1,335
Olive oil	4	10	7	10	6	5
Peanut oil	84	150	77	152	110	100
Soybean oil	533	586	762	1,234	1,240	1,300
Linseed oil[3]	381	466	700	715	770	500
Tung oil	[4]	4	2	5	2	9
Total[5]	8,781	9,382	9,977	10,847	10,931	9,790

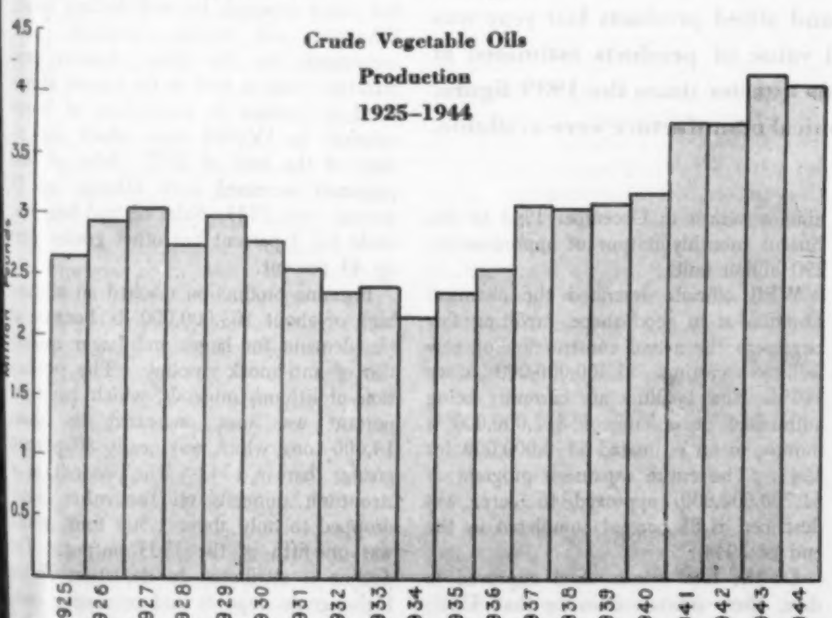
Compiled from reports of the Bureau of the Census, United States Department of Agriculture and Fish and Wildlife Service. [1] Based on most recent indications; subject to change. [3] Domestic production calculated as total production minus oil equivalent of net imports of flaxseed. [5] Excluding production of oils not reported separately by the Bureau of the Census, such as mustardseed oil and walnut oil. [4] Less than 500,000 pounds.

million pounds or about 64 percent would go into civilian soaps. The breakdown for other requirements of hard fats for 1944 was as follows, the figures being in terms of 1,000 lb.:

Military and export soaps	264,000
Paint	4,700
Printing ink	400
Lubricating oils and greases	207,000
Textiles and leather	106,000
Rubber	91,000
Core oil	3,500
Pharmaceuticals	5,200
Putty and caulking compounds	6,200
Miscellaneous	37,700

Cottonseed oil production last year declined owing to the fact that the seed supply was smaller and the drop in output of crude oil naturally was followed by a similar change in the volume of refined. Refining of peanut oil also failed to keep pace with the 1943 rate and in this case this resulted not from a drop in peanut production but to the movement of a larger part of the crop to other edible industries. Corn likewise was in strong demand from several consuming lines which served to limit production of both crude and refined oil. On the other hand the refined coconut oil output was about 20 percent larger in 1943 and soybean oil made a record showing, not only surpassing its previous high but for the first time in the history of the industry displaced cottonseed oil from the ranking position.

Attempts to develop a domestic tung oil industry have gone on for several years with varying success. Prospects are brighter than usual for 1945 when total production may reach 9,000,000 lb. The 1944 crop of nuts was favored with a good growing season and frost damage was much less than ordinarily encountered. Consumption of tung oil has been relatively small but existing stocks are steadily being lowered and the high price which has curtailed consumption will no doubt have a similar effect in the present year.



TURPENTINE AND ROSIN

Lack of sufficient manpower caused sharp curtailment in production of turpentine and rosin last year with closing months of crop year expected to make even more unfavorable showing. Steadily mounting prices for gum rosin were checked by the establishment of ceilings.

Curtailment of operations at producing centers to a point where the output of turpentine and rosin in the 1944–45 season promises to be the lowest for many years, summarizes the most important development of last year in the naval stores industry. Export trade in recent years did not reach its earlier level but domestic consumption was moving up steadily and recovery from the low prices of the depression period acted as a stimulant to productive activities. The war years changed that condition and started a downward trend.

Shortage of labor, which was fairly general last year, was particularly noticeable in the naval stores trade. It cut down activities in the woods and at treating plants in the south and materially slowed up the movement of turpentine and rosin to distribution centers. As consuming demand for these products was more active, the outcome was that stocks were heavily drawn upon and the diminishing supply encouraged a rising price level in all markets.

By the middle of the year, prices for rosins had risen so high that the Office of Price Administration was forced to intervene and set a temporary ceiling on all grades of gum rosin. Many finished products which require rosin as a raw material, already were under ceilings and OPA was faced with the choice of raising those ceilings or of protecting them by cutting back sales prices for rosin. The prices established for rosins ranged from $5.10 per 100 lb. for B to $6.50 per 100 lb. for WW and X. The ceilings applied to sales made on the Savannah Cotton and Naval Stores Exchange. Sales made outside the exchange were adjusted according to the sellers differentials from the ceilings during the five-day period prior to the issuance of the regulation. Later permanent price ceilings were established.

Following the establishment of price controls, production fell off more sharply than before, possibly due somewhat to the controls but probably much more to a further drop in the labor force. In October, OPA granted a rise of 24c. per 100 lb. in the ceilings for each grade of gum rosin and it was freely admitted that this action was taken with the hope that it would encourage larger outputs. The Department of Agriculture has proposed that the industry establish a schedule for the coming season which would result in an increase of 40 percent in total output. The industry has expressed its willingness to

Production and Consumption

April-September, 1944

	Turpentine 50-Gal. Bbl.	Rosin 520-Lb. Drums
Carryover	295,581	794,786
Production	269,439	728,736
Gum	159,312	426,310
Wood	110,127	302,426
Available supply	565,020	1,523,522
Carryover, Sept. 30	258,443	661,594
Apparent consumption	306,577	861,928

Consumption by Industries

April-September, 1944

	Turpentine 50-Gal. Bbl.	Rosin 520-Lb. Drums
Abattoirs	....	425
Adhesives and plastics	231	14,335
Asphaltic products	....	1,864
Automobiles and wagons	102	136
Chemicals and pharmaceuticals	64,985	131,747
Ester gum and synthetic resins	5,905	111,515
Foundries and foundry supplies	315	8,367
Furniture	84	3
Insecticides and disinfectants	105	3,924
Linoleum and floor coverings	22	10,804
Matches	....	699
Oils and greases	103	22,510
Paint, varnish and lacquer	11,548	63,736
Paper and paper size	....	188,654
Printing ink	179	9,375
Railroads and shipyards	5,414	11,502
Rubber	244	8,662
Shoe polish and shoe materials	6,678	3,508
Soap	....	159,960
Other industries	116	2,401
Total industrial reported	96,031	754,127

Consumption of Rosin in Chemical Products

500-lb. bbl.

	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44
Chemicals and pharmaceuticals	123,339	163,583	116,007	251,251	258,765	227,505
Ester gum and synthetic resins	108,611	127,036	127,230	270,477	185,329	183,273
Insecticides and disinfectants	3,963	5,125	3,678	5,669	5,704	6,912
Adhesives and plastics	11,816	17,968	16,793	23,009	17,195	25,057
	247,729	313,712	263,708	550,406	466,993	442,747

Consumption of Turpentine in Chemical Products

50-gal. bbl.

Chemicals and pharmaceuticals	22,249	36,026	40,413	55,625	98,593	122,368
Ester gum and synthetic resins	9	....	....	....	358	15,176
Insecticides and disinfectants	452	354	486	354	192	221
Adhesives and plastics	526	716	365	343	591	467
	23,236	37,096	41,264	56,322	99,734	138,232

cooperate but the manpower situation must take a decided turn for the better if any such result is to be even approximated.

Comparisons of industry consumption of turpentine for the first six months of the 1944–45 season with that for the preceding year show an increase in the total movement with 96,031 50-gal. bbl. so distributed in the current season against 89,792 bbl. in the corresponding time in the preceding season. Consumption in the manufacture of chemicals and pharmaceuticals accounts for the greater part of the increased use although from a percentage standpoint the rubber trade made the best showing.

Industry consumption of rosin in the first half of the present season is reported at 754,127 drums of 520 lb. One of the important increases was noted in the case of the larger use of rosin in the manufacture of ester gum and synthetic resins which took about 15 percent of the total as against less than 11 percent in corresponding months of 1943. On the other hand, the use of rosin in paper and paper size last year fell off to a very marked degree. Use of rosin at soap plants was the largest on record last year but a good part of the increase was registered early in the year when prices for rosin were lower. In the latter part of 1943 soap makers were directed to increase their use of rosin and this order was effective in the first part of 1944 but was revoked when the supply of other soap-making materials increased.

The naval stores conservation program looking toward the conservation of timber and an increased production of naval stores will be continued in 1945 with but minor changes from the provisions which prevailed in 1944. An appropriation of about $900,000 is anticipated to carry out the details of the program. The main revision for this year is that payment for each working face is reduced from 1¾c. to 1½c.

CHEMICAL PRODUCTION

Domestic production of chemicals and allied products last year was the highest ever reached with total value of products estimated at $8,300,000,000 or about two and one quarter times the 1939 figure. Record supplies of minerals for chemical manufacture were available.

American chemical and allied products industry in 1944 achieved the highest production level in history, reaching a record output of $8,300,000,000 or roughly about two and a quarter times what it was in 1939, according to a report prepared by the Chemicals Bureau of the War Production Board. Chemicals and allied products in 1943 had a dollar value of $7,500,000,000 while 1942 production was estimated at $6,300,000 and the 1939 figure was $3,700,000,00.

The report stated that one of the outstanding achievements of the chemical and pharmaceutical industries in 1944 was the sensational increase in production of penicillin. It jumped from nine billion units a month in December 1943 to the current monthly output of approximately 290 billion units.

WPB officials described the chemical situation as in good shape, crediting this largely to the actual construction of new facilities costing $1,500,000,000 since 1939. New facilities are currently being authorized at a rate of $12,000,000 a month, or an estimated $150,000,000 for 1945. The entire expansion program of $1,700,000,000, approved to date, was described as 88 percent completed by the end of 1944.

Of the total construction approved to date, these officials estimate that $500,000,000 will be the cost of chemical plants erected as part of the program for the production of butadiene, styrene, neoprene and catalysts in the synthetic rubber process. Approved construction also includes approximately $350,000,000 for chemical plants to serve the Army Ordnance, while $50,000,000 worth of new plants will produce materials needed by the Chemical Warfare Service. It is pointed out that these figures do not include chemical-consuming plants such as military explosives, chemical warfare gas plants, bomb-filling lines, etc.

Doubling of the small arms ammunition program and the big expansion in the requirements for high explosives have been large factors in necessitating the new facilities scheduled for 1945.

The report touched on the labor shortage stating that manpower continues to be the one of the most vexing problems in the chemical and allied industries with the labor force drained by Selective Service requirements and by aircraft and shipbuilding industries luring many thousands seeking higher paid jobs. WPB officials estimate that there are 700,000 workers engaged in the chemical and allied industries and that about 50,000 more persons are needed to fill the gap in the labor force.

The Bureau of Mines summarizes production in 1944 of minerals for chemical usage, as follows: "The manufacture of synthetic rubber and other chemical uses stimulated an 8-percent increase in sales values of salt. The quantity sold—more than 16 million tons—was nearly 6 percent greater than in 1943. The chemical, and particularly the fertilizer industries, created an active demand which increased the sales of sulphur to 3½ million tons, 18 percent higher than in 1943. Pyrite production increased about 6 percent.

Crude barite sales increased about 25 percent, reaching 525,000 tons to satisfy the heavy demands for well-drilling muds, lithopone, and barium chemicals. Requirements for the glass, cleanser, and fertilizer trade as well as for export stimulated an increase in production of boron minerals to 330,000 tons, which was almost of the level of 1937. Sales of lead pigments increased with litharge up 19 percent over 1943. Sales of lead-free zinc oxide fell 3 percent but other grades were up 44 percent.

Bromine production reached an all-time high of about 103,000,000 lb. because of the demand for larger and larger quantities of anti-knock gasoline. The production of lithium minerals, which have important war uses, increased to about 14,600 tons, which was nearly 80 percent greater than in 1943. The production of strontium minerals on the other hand, dropped to only about 1,500 tons, which was one-fifth of the 1943 output. The decline is attributed to depletion of the higher-grade deposits and increasing competition of barite in well-drilling muds."

ALKALIS AND CHLORINE

(*Continued from page 129*)

found that caustic needs could otherwise not be supplied. In addition, government plants which had been built largely for chlorine turned out large quantities of caustic as well, which was turned over to private producers for distribution to their industrial customers.

Consumption trends in the alkali field were upward, with few exceptions, as indicated at the consumption tables on page 129. Total use of soda ash is calculated at 4,701,000 tons, an increase of about 3.5 percent from the 4,543,000 tons estimated for 1943. Compared with 1942, the increase is almost 20 percent. Among the main consuming groups only nonferrous metals took less ash than in the preceding year, the indicated drop of 20 percent being a reflection of the substantial cutback that was made in the over-large aluminum program.

Container glass continued to be the big tonnage outlet for ash. That industry operated at more than 100 percent of capacity throughout the year, taxing suppliers severely. Flat glass on the other hand remained far below prewar levels, unable to replace the former huge automobile market with war business.

Most consuming industries showed relatively minor increases, dictated largely by higher production rather than by any changes in technology. One of the lesser uses, water softeners, is estimated to have had the greatest percentage increase, 15.8 percent. Petroleum refining, the smallest group shown, had the second largest increase, 10 percent. Tonnagewise, the largest increases were in chemicals and glass with increases of 8.4 and 7.5 percent respectively. Miscellaneous uses were up by an estimated 8.1 percent; soap, 8 percent; cleansers and modified sodas, 5.9 percent; textiles, 5.2 percent; pulp and paper, 3.2 percent; and caustic and bicarbonate, less than 0.8 percent. Bicarbonate production decreased from 173,000 tons in 1943 to an estimated 157,000 tons in 1944, while lime-soda caustic, as already noted, increased very moderately.

In the case of caustic soda, consuming trends were somewhat similar to those for ash. Total consumption is estimated at 1,883,000 tons, about 6.5 percent above the 1,769,000 tons of 1943 and 28.6 percent above 1942, a year when considerable caustic stocks were accumulated. Rather small decreases occurred in the fields of textiles and vegetable oils, the former showing a consumption drop of 16.7 percent owing to reduction in mercerizing, and the latter, a 5.3 percent decrease. Soap showed the largest percentage gain, 19 percent, followed by lye and cleansers, 10 percent; rayon and other viscose products, 9.4 percent; miscellaneous uses, 7.9 percent; and petroleum refining, 7.7 percent. The group of smaller percentage increases includes chemicals, 5.6 percent; pulp and paper, 5.3 percent, and rubber reclaiming, 4.2 percent.

We have not attempted to break down chlorine consumption in detail, although it is estimated that about three-quarters of the supply went to chemicals, as compared with less than one-third in 1929. With the bulk of the huge government chlorine program completed in 1944, it is believed that most uses received substantially what was needed. The main restriction, on pulp and paper, came not as much from the over-all decrease as from the fact that requirements for nitrating and dissolving pulp were larger, thus further restricting chlorine for other paper products.

ALCOHOL AND SOLVENTS

(*Continued from page 133*)

glycerine was relatively high last year running about 100,000,000 lb., about the same as high gravity and yellow distilled. In 1943 production of CP was but 63,242,000 lb. and high gravity and yellow distilled, 96,467,000 lb.

Stocks of glycerine at the beginning of 1944 amounted to approximately 81,000,000 lb. and they increased each month through May. Under the more favorable supply position restrictions on the use of glycerine were modified and then removed. With the exception of the summer months, production held up well and the year closed with a gain in the carryover.

THE OUTLOOK

The alcohol and solvent market for the coming year, as is the case with most other commodities, will be influenced largely by the progress of the European war. If it continues throughout the greater part of 1945 it can be assumed that existing conditions will continue for the entire year. If, however, the war should end during the spring, methyl alcohol would become available for anti-freeze use and the direct military and Lend-Lease requirements for ethyl alcohol would be greatly curtailed. This would mean a much easier market for ethyl alcohol although prices would undoubtedly remain high for the balance of the year, possibly well into 1946. During this period fermentation producers would be forced to compete with low price synthetic ethyl and isopropyl. It is expected that there will be considerable pressure brought by the agricultural bloc to utilize grain for the production of alcohol to be used in motor fuel. How much grain will be available for this purpose will be largely determined by European demands for food.

Isopropyl alcohol will follow the lead of acetone as any falling off in production of the latter will make larger supplies of isopropyl available for ordinary use. There also is the possibility that as prices for isopropyl undoubtedly will be less than those for fermentation alcohol for some time, a large amount of isopropyl may be used in fields which ordinarily have not used isopropyl. This possibility is heightened by the fact that competition may be keen in the postwar period in the end products for which the various alcohols are important raw materials. Normal butyl alcohol will remain tight regardless of the time of termination of the war as the backlog of products into which it goes is greater than in almost any other line.

European countries also may be confronted with a manpower problem when it comes time to put their rehabilitation program into effect. In several countries, homes of a large part of the population have been demolished or damaged and a large percentage of labor undoubtedly will be required to rehabilitate living conditions for the population so that they will have adequate shelter and sanitary protection. This may operate against any immediate resumption of manufacturing lines on a large scale and call for a larger import of raw materials including chemicals and of the finished products which consume large amounts of chemicals.

SYNTHETIC RUBBER

A REPORT from the Department of Commerce reveals that Rubber Reserve Co.'s production of synthetic rubber has been approximately 1,000,000 long tons, 737,000 tons of which were produced last year. In addition to government plants, private industry turned out 26,000 long tons in 1944. There are 47 chemical, petroleum, rubber, and industrial companies operating plants for account of Rubber Reserve Co. Our synthetic rubber plants are capable of producing at least 1,000,000 long tons of rubber a year if necessary.

In addition to the production of synthetic rubber, the plants have produced more than 25 million gallons of ethylbenzene and about 4 million gallons of cumene, used in the manufacture of aviation gasoline.

Rubber importations since early 1940 have been more than 2,280,000 long tons. Rubber Reserve Co.'s importations of natural rubber, including 83,000 tons bought from Commodity Credit Corp., have been 930,000 long tons, 116,000 tons of which were received in 1944.

From June 1942 to Jan. 1, 1944, Rubber Reserve Co. was the sole buyer and seller of scrap rubber. In that period it purchased a little more than 1,100,000 short tons, 920,000 tons of which have been sold.

The investment in plants and facilities for the manufacture of synthetic rubber run something over $700 millions.

United States Production of Certain Chemicals

December 1944, December 1943 and Totals for the Years 1944 and 1943

Chemical and Basis	Unit	December 1944	December 1943	Twelve-Month Totals 1944	Twelve-Month Totals 1943
Acetylene:					
For use in chemical synthesis	M cu. ft.	319,079	324,253	3,884,495	2,761,658
For commercial purposes	M cu. ft.	131,912	149,224	1,652,236	1,738,105
Ammonia, synthetic anhydrous (100% NH_3)[1]	Tons	50,833	48,657	543,398	542,879
Bleaching powder (35-37% avail. Cl_2)	M lb.	2,466	5,591	47,578	62,745
Calcium acetate (80% $Ca(C_2H_3O_2)_2$)	M lb.	957	1,356	11,677	20,079
Calcium arsenate (100% $Ca_3(AsO_4)_2$)	M lb.	1,303	5,855	47,425	69,863
Calcium carbide (100% CaC_2)	Tons	63,713	55,985	781,215	620,847
Calcium hypochlorite (70% avail. Cl_2)	M lb.	1,214	971	14,117	11,577
Calcium phosphate (100% $CaH_4(PO_4)_2$)	M lb.	4,461	5,147	60,016	66,527
Carbon dioxide (100% CO_2):					
Liquid and gas	M lb.	19,142	26,444	335,203	317,839
Solid (dry ice)	M lb.	42,761	39,237	646,321	550,702
Chlorine	Tons	104,339	111,584	1,259,500	1,211,920
Chrome green (C. P.)	M lb.	648	627	6,575	8,020
Hydrochloric acid (100% HCl)	Tons	33,975	30,912	377,902	341,987
Hydrogen	M cu. ft.	2,086,000	1,771,000	24,327,000	22,930,000
Lead arsenate (acid and basic)	M lb.	7,962	6,970	89,841	73,955
Lead oxide, red (100% PbO)	M lb.	7,936	9,406	103,767	101,767
Methanol:					
Natural (80% CH_3OH)	M gal.	356	379	4,198	4,851
Synthetic (100% CH_3OH)	M gal.	5,851	5,069	71,280	64,958
Molybdate orange (C. P.)	M lb.	105	96	1,340	1,720
Nitric acid (100% HNO_3)	Tons	41,328	39,571	469,335	485,274
Nitrous oxide (100% N_2O)	M gal.	9,440	7,363	117,990	108,336
Oxygen	M cu. ft.	1,496,821	1,443,379	18,743,067	16,572,862
Phosphoric acid (50% H_3PO_4)	Tons	58,364	53,705	691,954	636,676
Potassium bichromate & chromate (100%)	M lb.	489	647	7,347	9,557
Potassium hydroxide (100% KOH)	Tons	4,048	3,533	44,264	40,803
Soda ash (commercial sodium carbonate):					
Ammonia-soda process (98-100% Na_2CO_3)					
Total wet and dry[2]	Tons	368,588	392,633	4,538,498	4,407,618
Finished light[3]	Tons	197,315	205,637	2,455,368	2,299,776
Finished dense	Tons	124,019	124,515	1,461,832	1,393,952
Sodium bicarbonate (100% $NaHCO_3$)	Tons	13,274	14,192	157,774	172,998
Sodium bichromate & chromate (100%)	Tons	6,854	6,688	81,977	82,464
Sodium hydroxide, liquid (100% NaOH):[4]					
Electrolytic process	Tons	103,708	105,482	1,206,039	1,038,577
Lime-soda process	Tons	62,354	56,037	688,565	663,495
Sodium phosphate:					
Monobasic (100% NaH_2PO_4)	M lb.	2,282	2,096	29,154	21,810
Dibasic (100% Na_2HPO_4)	Tons	3,951	3,946	55,804	45,910
Tribasic (100% Na_3PO_4)	Tons	6,584	6,463	80,291	72,632
Sodium sulphate:					
Anhydrous (refined) (100% Na_2SO_4)	Tons	5,576	5,792	75,482	64,174
Glauber's salt and crude salt cake[5]	Tons	67,490	68,102	799,596	805,257
Sulphur dioxide (100% SO_2)	M lb.	6,225	6,745	77,136	73,090
Sulphuric acid (100% H_2SO_4)[6]					
Chamber process	Tons	293,503	294,067	3,240,642	3,147,590
Contact process[6]	Tons	559,751	523,671	6,028,184	5,456,986
Net contact process[7]	Tons	483,328	459,856	5,311,681	4,888,490
White lead	Tons	7,654	7,231	86,531	67,585

Data for this tabulation have been taken from the "Facts for Industry" series issued by the Bureau of the Census and the WPB Chemicals Bureau. Production figures represent primary production and do not include purchased or transferred material. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. [1] Includes a small amount of aqua ammonia. [2] Total wet and dry production including quantities diverted for manufacture of caustic soda and sodium bicarbonate and quantities processed to finished light and finished dense soda ash. [3] Not including quantities converted to finished dense soda ash. [4] Includes quantities evaporated to solid. [5] Collected in cooperation with Bureau of Mines. [6] Includes oleum grades. [7] Excludes spent acid.

CONSUMPTION OF TALC

PRODUCTION and consumption of ground talc has been supervised by the Miscellaneous Minerals Division of War Production Board. The accompanying table indicates reported figures for consumption of ground talc by various chemical industries during three recent periods.

WPB had been building up a stockpile of steatite to stabilize supply conditions, but last September reported that sufficient quantity was in stock. Consideration has been given both to steatite and non-steatite grades in the controls and for the tabular data. However, pyrophylite is not included in these summaries, although it is often substituted for talc being actually preferable for certain few uses such as for insecticide carrier. Army purchase of DDT specifies pyrophylite as such dilutent mineral.

It had been expected that less talc would be required for compounding synthetic rubber than when natural crude rubber was used. This is true only with respect to the use as a pigment. The quantity of talc required for rubber manufacturing as a whole is greater when one includes dusting, mold facing, and other non-pigment uses.

End Uses of Ground Talc

Short Tons

	1941 Bur. Mines Data	1943 Computed	Last Half 1944 Estimated
Paint	111,736	100,361	50,000
Roofing materials	23,040	42,414	19,000
Paper	37,894	31,661	17,000
Rubber	33,278	23,293	16,000
Miscellaneous	22,275	22,103	11,000
Steatite ceramic uses	62,667	35,543	8,000
Other ceramic uses			11,000
Cosmetics	13,128	18,220	15,000
Textiles	no data	13,143	7,000
Insecticides	4,725	11,649	7,000
Crayons	3,180	no data	no data
Foundry facing	3,023	no data	no data
Total	314,936	298,083	161,000

Figures reported by U. S. Bureau of Mines for 1941 and estimated from reports for 1943 and for prospective use during the last half of 1944 on the basis of WPB data.

U. S. Production, Consumption and Stocks of Synthetic Organic Chemicals

November 1944 and Eleven Month Totals

Item	November (Lb.)	11-Month Total M Lb.
Acetanilide		
Consumption	45,388	1,70
Stocks	305,133	
Acetic acid (synthetic)[1]		
Production	28,451,893	[2]267,25
Consumption	17,863,173	188,94
Stocks	9,908,324	
Acetic acid (natural)[2]		
Production	3,546,799	36,90
Stocks	1,427,012	
Acetic anhydride		
Production		[3]365,34
Consumption		[3]280,43
Acetylsalicylic acid		
Production	774,291	88,41
Stocks	910,071	
n-Butyl acetate		
Production	5,401,955	64,22
Stocks	3,190,524	
Creosote oil, tar distillers (gal.)[4]		
Production	10,262,031	110,33
Consumption	638,390	9,13
Stocks	10,393,778	
Creosote oil, byproduct (gal.)[5], [6]		
Production	3,222,103	38,00
Consumption	19,926	63
Stocks	536,749	
Cresols, meta-para[7]		
Production	382,474	6,33
Stocks	338,630	
Cresols, ortho-meta-para[7]		
Production	729,150	9,38
Cresylic acid, crude		
Production	2,280,341	23,33
Stocks	736,186	
Cresylic acid, refined[7]		
Production	3,279,265	36,64
Stocks	1,904,653	
Diethyl ether (all grades)		
Production	6,952,897	62,88
Stocks	4,479,340	
Ethyl acetate (85 percent)		
Production	10,366,097	98,32
Consumption	1,041,706	14,94
Stocks	4,872,993	
Lactic acid (edible)		
Production	253,222	3,50
Stocks	241,162	
Lactic acid (technical)		
Production	615,170	3,53
Consumption	9,955	17
Stocks	243,012	
Methyl chloride (all grades)		
Production	2,490,243	23,33
Stocks	423,711	
Naphthalene (coke-oven operators)[6], [9]		
Production	8,427,345	94,60
Stocks	1,966,740	
Naphthalene (tar distillers)[9]		
Production[10]	19,473,424	185,08
Stocks	7,693,999	
Naphthalene, refined[11]		
Production	6,304,297	75,92
Consumption	4,940,888	50,957
Stocks	2,534,530	
Oxalic acid (technical)		
Production	1,550,344	16,35
Stocks	349,778	
Phenobarbital and sodium salts		
Production	22,463	31
Consumption	10,263	
Stocks	45,045	
Phthalic anhydride		
Production	10,425,671	113,28
Consumption	4,020,089	35,02
Stocks	2,835,145	[illegible]
Riboflavin (for human use)		
Stocks	34,211	
Sulfa drugs[12]		
Production	319,527	4,2
Consumption	25,461	
Stocks	834,100	

Statistics collected and compiled by the U. S. Tariff Commission, except where noted. Where no November figures are given, data are confidential. [1] Excludes recovered acetic acid. [2] Acetic acid produced by direct process from wood and from calcium acetate. Compiled by Bureau of Census. [3] 9-month total. Figures published quarterly include anhydride from acetic acid by vapor-phase process. [4] Product of distillers who use purchased coal tar only. [5] Product of byproduct coke-oven operators only. [6] Statistics collected and compiled by Coal Economics Division, U. S. Bureau of Mines. [7] Statistics reported by byproduct coke-oven operators combined with those reported by tar distillers to prevent disclosure of operations of individual companies. [8] 10-month total. Production for June not revealed. [9] Statistics combine three grades: solidifying at less than 74, 74 to less than 76, and 76 to less than 79 deg. C. [10] Production for sale only in case of less than 74 grade. Production both for consumption within producing plant and for sale in case of other two grades. [11] 79 deg. C. and over. [12] Includes data for acetylsulfathiazole, both as drug and as intermediate, resulting in appreciable unavoidable duplication.

CHEM. & MET. PLANT NOTEBOOK

THEODORE R. OLIVE, Associate Editor

$50 WAR BOND FOR A GOOD IDEA!

Until further notice the editors of *Chem. & Met.* will award a $50 Series E War Bond each month to the author of the best short article received during the *preceding* month and accepted for publication in the "*Chem. & Met. Plant Notebook.*" Articles will be judged during the month following receipt, and the award announced in the issue of that month. The judges will be the editors of *Chem & Met.* Non-winning articles submitted for this contest may be published if acceptable, and if published will be paid for at space rates applying to this department.

Any reader of *Chem. & Met.*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible. Neither finished drawings nor polished writing are necessary, since only appropriateness, novelty and usefulness of the ideas presented are criteria of the judging.

Articles may deal with any sort of plant or production "kink" or shortcut that will be of interest to chemical engineers in the process industries. In addition, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address entries to Plant Notebook Editor, *Chem. & Met.*, 330 West 42nd St., New York 18, N. Y.

JANUARY WINNER!

A $50 Series E War Bond will be issued in the name of

C. R. FRANKLIN
Chemical Engineer
Derby, England

For an article dealing with a vapor-liquid equilibrium nomograph for binary systems which has been adjudged the winner of our January contest

This article will appear in our March issue. Watch for it!

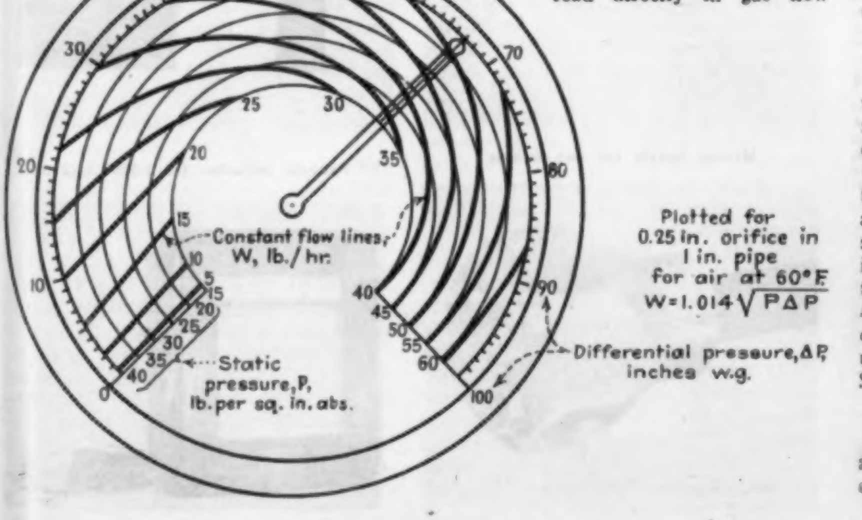
January Contest Prize Winner

SIMPLE DIAL CHART MAKES GAS FLOW INDICATORS DIRECT READING FOR FIXED TEMPERATURE

MELVIN NORD
Chemical Engineer
Matawan, N. J.

Measuring gas flow by means of orifice meters requires corrections for the gas pressure, since gases cannot generally be considered incompressible. These corrections can be made automatically on flow recorders but are expensive—or they can be made by means of calibration charts, but these are time-consuming and prevent the instruments from being direct reading. A simple method for making a bourdon gage a direct-reading gas flow indicator is hereby described.

Consider an orifice meter for measuring the flow of gases. One bourdon gage reads the upstream pressure, and another reads the pressure differential across the orifice. The face of the latter gage may be regarded as a polar coordinate chart, with upstream pressure as radius vector and differential pressure as the angular variable.



By calibration as described a bourdon gage can be read directly in gas flow

If the flow calibration curves are then drawn on this polar coordinate chart, the gage needle points directly to the angular variable, Δp. It is then merely necessary to locate the point on the chart which corresponds to the upstream pressure. The point thus determined will fall on a line of constant flow (or between two lines).

The face of the gage will contain these flow lines and they may or may not contain the pressure lines. The pressure lines may be omitted, if the gage needle is calibrated linearly along its length in terms of upstream pressure.

As an example, the case of a 0.25-in. orifice in a 1-in. pipe carrying flowing air at 60 deg. F. has been drawn up and is shown in the accompanying figure. Pressures between 15 and 40 lb. per sq.in. abs. and differential pressures up to 100 in. of water were taken as the ranges. Flows were calculated from the orifice formula given by Davis in "Chemical Engineering Nomographs," p. 54, which can be converted to the form:

$$W = 350\, C_f\, d^2 \sqrt{\frac{407\, T_s\, \rho_s}{14.7\, T\, P_s}}\, \sqrt{P\, \Delta P}$$

where W is pounds of gas per hour at standard conditions; C_f is a combined discharge and velocity-of-approach coefficient (about 0.61 for small orifice ratios); d is the orifice diameter in inches; T_s and P_s are standard temperature and pressure, respectively, in absolute units; T is the existing temperature in absolute units; ρ_s is the density in pounds per cu.ft. at S. C.; ΔP is the differential pressure across the orifice in inches of water; and P is the upstream pressure, pounds per sq.in. abs. Substituting the given conditions gives:

$$W = 1.014\sqrt{P\, \Delta P}$$

For pressure of 30 lb. per sq.in. abs. and a ΔP of 67 in., the flow rate will be 46 lb. of air per hour, as is seen on the chart.

PROCESS EQUIPMENT NEWS

THEODORE R. OLIVE, Associate Editor

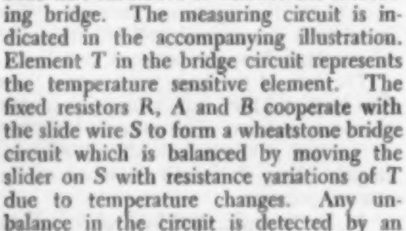
ELECTRONIC THERMOMETER

INDICATING, recording and controlling of temperatures in the range between minus 100 and plus 1,000 deg. F. is the function of a new electronic-type resistance thermometer announced recently by Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland, Ohio. The instrument operates on the null-balance system and provides instantaneous balancing action by electronic detection and control. Detection of the unbalance of the measuring bridge is accomplished by electron tubes without the aid of a galvanometer or other moving part. The resulting design is said to be reliable and accurate over long periods of continuous operation.

The recorder-controller is of the circular-chart type, with an indicating scale arranged circumferentially around the chart. A large pointer enables the temperature to be read easily at a distance of 50 ft. Indicating, recording and controlling mechanisms are all driven by the same reversible electric motor which adjusts the slide wire resistance to balance the measuring bridge. The measuring circuit is indicated in the accompanying illustration. Element *T* in the bridge circuit represents the temperature sensitive element. The fixed resistors *R*, *A* and *B* cooperate with the slide wire *S* to form a wheatstone bridge circuit which is balanced by moving the slider on *S* with resistance variations of *T* due to temperature changes. Any unbalance in the circuit is detected by an electronic amplifier which in turn controls the motor operating the slide wire, indicating, recording and controlling elements. Air-operated, electronic or on-and-off electric contact control may be provided. Up to four pens for recording, each provided with its own continuously connected electronic control unit and measuring bridge, can be had in a single instrument.

Decals for Fire Extinguishers

To insure accurate choice of the proper type of first aid fire extinguisher to be used in the event of an emergency, Walter Kidde & Co., New York 6, N. Y., has available a set of three decalcomanias which can be transferred to the extinguisher itself or to the wall behind its station, indicating briefly and clearly the types of fire for which that particular unit is suitable, as well as those types for which it should not be used. A limited number of sets will be supplied free, while a larger quantity may be had at a nominal charge. The illustration shows the three types, for three main classes of fire.



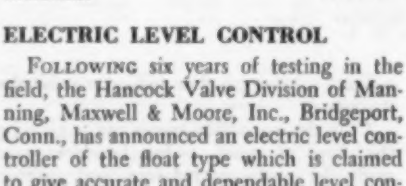
MIXING NOZZLE

AS A MEANS of mixing two liquids, the Spraying Systems Co., 4023 West Lake St., Chicago 24, Ill., has developed a liquid proportioning and mixing nozzle which, as is shown in the accompanying illustration, is a four-nozzle assembly with one nozzle mounted in the center of the mixing head and three placed on 120-deg. centers near the outer edge. A side line feeds the center nozzle, while the other three are supplied from the main line. Outer nozzles are set on the concave face of the mixing head at an angle calculated to produce thorough mixing of the four streams. Each of the streams issues as a full-cone-pattern spray of uniform distribution. Nozzle combinations may be varied to obtain any desired proportions of the two liquids being mixed. This equipment is available in brass and stainless steel, as well as other materials.

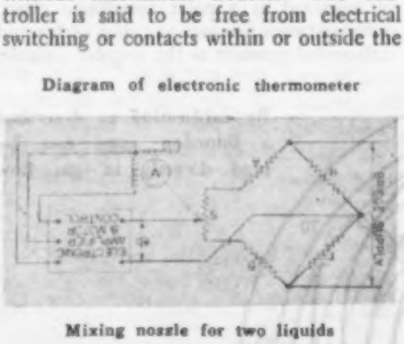
ELECTRIC LEVEL CONTROL

FOLLOWING six years of testing in the field, the Hancock Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has announced an electric level controller of the float type which is claimed to give accurate and dependable level control to within a fraction of an inch, and without mechanical trouble. The controller is said to be free from electrical switching or contacts within or outside the float chamber and to have no levers, linkages, bellows, stuffing boxes, cooling fins, mercury switches or wearing parts. A simple screw adjustment provides for immediate raising or lowering of the control level.

Diagram of electronic thermometer



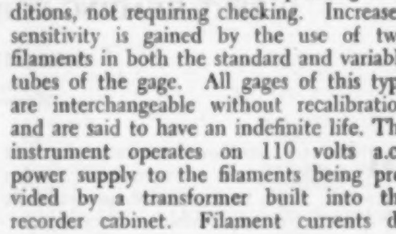
Mixing nozzle for two liquids



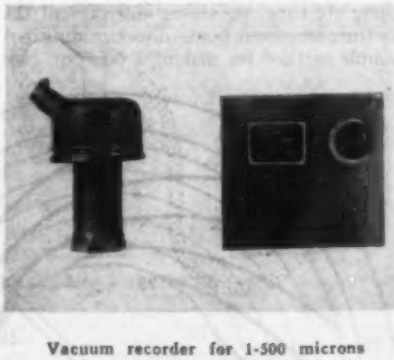
VACUUM RECORDER

FREEDOM from need for recalibration on different operating gases and contaminants is claimed for the new Televac type 500 thermal gage for indicating and recording vacuums in the range of 1 to 500 microns, recently developed by George E. Fredericks Co., Bethayres, Pa. The complete instrument, including the recorder, is known as the Model MR Televac. The new thermal gage contains filaments that have been covered with a protective coating said to make them immune to contaminating vapors such as oil, water, mercury, etc., usually found in vacuum systems. Thus the calibration of the gage is said to be constant under all normal operating conditions, not requiring checking. Increased sensitivity is gained by the use of two filaments in both the standard and variable tubes of the gage. All gages of this type are interchangeable without recalibration and are said to have an indefinite life. The instrument operates on 110 volts a.c., power supply to the filaments being provided by a transformer built into the recorder cabinet. Filament currents do

Electric level float control



Vacuum recorder for 1-500 microns



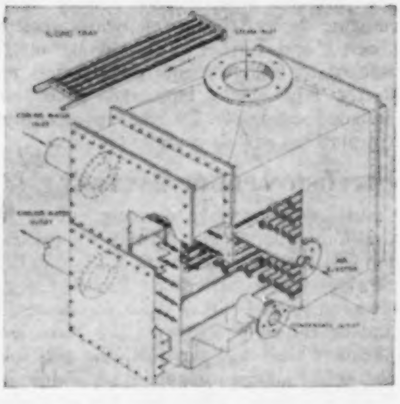
Intimate blending system for powders

not need to be adjusted in use to obtain correct readings. The instrument records continuously and, by use of a multiple-point recorder, is able to record the vacuum in several systems simultaneously.

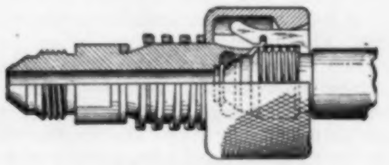
INTIMATE BLENDER

Field testing of a new system for intimate blending of fine powders has progressed to the point where the manufacturer, Sprout, Waldron & Co., Muncy, Pa., is now able to release details. The system is applicable to mixtures of powders finer than 100 mesh or to mixtures of such powders with liquids, to give a dry, free-flowing product, where a degree of homogeneity beyond that obtainable by conventional mixing methods is essential. Such a system, in use by the Michigan Fertilizer Co., Lansing, Mich., is shown in an accompanying view. Although it requires only a single 15-hp. motor, production rate of this equipment is said to be in excess of five 500-lb. batches per hour when producing a fine insecticide dust blend.

The system includes a sifter at the inlet to eliminate compacted lumps in the feed which often result from storage. Following this is a brief premixing of conventional type. When a liquid is to be included, it is sprayed from a manifold during the premixing period. Following this is a violent agitation of the premix as it passes in a thin layer through a high-speed disk blender which assures dispersal of small but persistent lumps. The product then drops to an agitated aerator-mixer which maintains free flowing characteristics otherwise lost when such powders are allowed to settle. This section of the equipment acts also



Novel extended-surface condenser



Coupling for testing applications

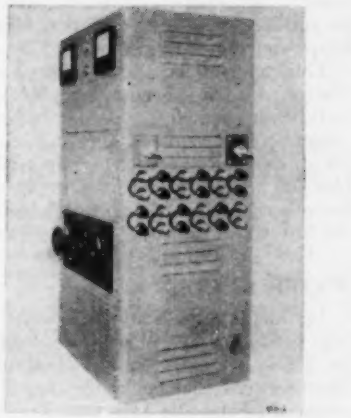
as a storage reservoir ahead of the sacking equipment. The method is said to have proven applicable to a wide variety of materials and to be capable of producing products of unusual uniformity, turned out at high capacity and with low power consumption.

DIRECT-CONNECT COUPLINGS

Sizes from ¼ to ¾ in. are available in a new line of direct-connect couplings developed primarily for quick disconnection of testing operations by the E. B. Wiggins Oil Tool Co., 3424 East Olympic Blvd., Los Angeles 23, Calif. Presumably the coupling should find application outside of test work on pressure equipment, wherever quick disconnecting is necessary. The new coupling, similar in principle to the company's larger quick-disconnect couplings, fits over the end of any standard nipple. The coupling is equipped with a seal which has withstood pressures up to 3,000 lb.

NOVEL STEAM CONDENSER

Approximately twice the condensing capacity of conventional smooth-tube condensers is claimed for the new Dawes condenser, developed under the direction of engineers of Contract Engineering, San Francisco, Calif. The new condenser is unusual in the type and arrangement of its tubes. These are of special extruded-surface construction and are about one-third as long as those in a conventional unit of the same capacity. Being mounted in a convenient "file-cabinet" arrangement in removable trays, banks of tubes can be removed quickly and immediately replaced with standby banks without major loss of operating time for the condenser. Tubes may be readily removed for cleaning and since the entire condenser requires little space, a multiple installation of Dawes condensers can provide spare capacity to permit shutdown for cleaning of individual condensers without shutting



Multi-range rectifier

down the plant. In a test model of this condenser recently subjected to thorough investigation, the shell, 2x3x3 ft. in dimensions, inclosed 314 lineal ft. of special extruded surface tubing arranged in 26 trays, five tubes to a tray. During the test, 72,000 lb. of steam at 266 deg. F. was condensed per hour using water at 77 deg. F. inlet temperature, a tube velocity of 6 ft. per second and 3,200 lb. per minute of cooling water. This condenser of 64 sq.ft. of surface gave substantially the same result as a conventional condenser, tested simultaneously, having 123 sq.ft. in surface.

FLEXIBLE RECTIFIER

Extreme flexibility is claimed for the new Multi-Rectifier developed by the Green Electric Laboratories, 130 Cedar St., New York 6, N. Y. This feature is said to make it particularly suitable for use in research and development laboratories having need for variable d.c. voltages and amperages up to 100. The unit allows for a range of from 0 to 48 volts in a compact mechanism. It incorporates six selenium rectifier sections which may be interconnected by external links to provide four ranges of d.c. power of: (1) up to 100 amp. at 0-8 volts; (2) up to 50 amp. at 0-16 volts; (3) up to 35 amp. at 0-24 volts; and (4) up to 18 amp. at 0-48 volts. A built-in voltmeter and ammeter indicate the d.c. power output voltage and current at all times. Standard equipment includes automatic overload warning and protection equipment and on-off push buttons.

ELECTRONIC CONTROLLERS

Electric control contacts can now be added to the electronic potentiometers of the circular chart type of its manufacture, according to the Brown Instrument Co., Wayne and Roberts Aves., Philadelphia, Pa. These electronic contact controllers are provided in two forms, one containing a locking-in type relay, designed primarily for electric furnace control and for applications involving the use of contactors for processes requiring a differential gap. The second, without a relay, is designed for direct control of motorized valves, operation of signalling devices and for applications requiring a "dead" neutral. Similar electric contacting equipment can now be applied to this company's circular poten-

tiometer pneumatic controllers, serving as an auxiliary switch for operation of signal lamps and other devices.

This company has also announced a new line of sensitive pressure gages of spring and bellows-actuated type for measuring ranges between zero and 5 in. and zero and 50 in. of water. Two types are available. One has a single spring for pressure alone, the other a second spring, in tandem with the first, for vacuum and compound ranges.

WATER HEATER

INSTANTANEOUS heating of water with high pressure steam, in capacities from 200 to 3,000 g.p.h., is the function of the Northwestern Safety water heater announced by the Coe Mfg. Co., Painesville, Ohio. The unit is compact and complete, containing regulator and safety features built into or attached to the heater head. Installation requires only the attachment of three pipes, the high pressure steam supply, cold water inlet, and hot water outlet. The unit is designed to deliver water at 110 to 120 deg. F., suitable for factory wash room service. In addition to the steam supply regulator which is the main temperature controller, the unit also is equipped with a tempering valve in the hot water outlet to guard against scalding temperature in the event of regulator failure or other contingency. Steam enters through a strainer and regulator into a copper coil where it heats the water and condenses. The condensate then passes directly into the water space, obviating the need for a steam trap.

INFRA-RED DRYER

A RECENT announcement of J. O. Ross Engineering Corp., 350 Madison Ave., New York 17, N. Y., states that after careful investigation of the relative advantages and disadvantages of infra-red radiation as a source of heat for drying operations, this concern is now prepared to supply dryers and drying ovens which combine the use of infra-red lamps with circulated air. The design varies, of course, with the type of product which is to be dried. In all cases, it is recognized that it is necessary to control ambient oven temperatures and thus put all the available heat to work, and that it is necessary to control positively the air makeup and exhaust volumes. In some types of installations enough lamps will be provided to supply all the energy required for heating the stock as well as the surrounding air. In other installations, particularly where large amounts of solvents or other vapors are to be exhausted, additional heat sources may have to be provided. In one type which is suitable for use wherever the temperature of the goods can be measured by means of a thermocouple, as in the case of drugs and chemicals, an accurate method for controlling the ambient temperatures by means of the temperature of the goods themselves is employed.

This combination system, known as Airay, employs inclosures fabricated of sheet metal, Transite, or prefabricated, insulated panels of this company's tongue-and-groove construction, depending on requirements. All electric parts, including the infra-red bulb sockets, are of heat-resisting design, the wiring being asbestos covered and further protected by metal raceways. Bulbs are of the sealed-in reflector type while fans and ducts are designed especially for the temperatures encountered and air volumes required.

EXPLOSION-PROOF BATTERY

ANNOUNCEMENT of development of an explosion-proof storage battery for electric industrial trucks has been made by the Storage Battery Division, Philco Corp., Trenton 7, N. J. This battery was designed and developed jointly with the Navy Department, but will eventually be available for industrial use, in powering industrial trucks employed where any fire or explosion hazard exists. The design of the battery is such that, after the truck in which it is used leaves the battery-charging station, all component parts are locked and cannot be opened until the battery is returned for recharging. Any storage battery normally discharges a certain amount of gas during its duty cycle. The construction of the explosion-proof compartment of the battery provides an air cylinder discharging into the space above the battery itself at a predetermined rate so that the gases from the battery are so diluted with air before exhausting to the atmosphere that the mixture is not combustible.

HIGH-VACUUM GAGE

TRU-VAC is the name of a new high-vacuum gage of the Pirani type, for vacuum measurements in the range from zero to 3,000 microns, which is being manufactured by the Continental Electric Co., Geneva, Ill. The gage indicates the presence of water and other vapors, taking note of vacuum changes as they occur. It may be placed in any desired location in the vacuum system and is direct reading. It operates on the power provided by one or two No. 2 dry cells and may be installed in rubber, sealed to hard or soft glass systems, or coupled to ½-in. standard pipe connections.

MULTIPLE-TEST CABINET

ANY or all of the following tests of water: hardness, alkalinity, chloride, phosphate, pH, sulphite, sulphate and dissolved oxygen, can be performed with the new Multi-test cabinet recently announced by the Bird-Archer Co., 90 West St., New York, N. Y. This cabinet, shown in the accompanying illustration where testing equipment for hardness, alkalinity, chloride and soluble phosphate is provided, is of white-enameled heavy sheet metal, equipped with glareless built-in fluorescent lighting so that the most delicate end point can be seen. Specially designed titration tables are provided to help eliminate any possibility of splashing of the sample.

Multi-test cabinet for water

QUICK-OPENING DOOR

CLOSING of high-pressure or vacuum processing equipment is accomplished by means of a new all-welded quick-opening door recently announced by Struthers Wells Corp., Titusville, Pa. The door is provided in both manual and hydraulic operated types. In both cases, simplicity and ease of operation are claimed. Locking of the door is accomplished by a split ring, fitting into a circular groove in the door frame. For closing, this ring is expanded into the frame groove and the load is evenly distributed over the full circumference of the frame. For opening, the ring is contracted to clear the door frame. A safety device has been incorporated so that pressure cannot be applied to the vessel if the locking ring is not properly seated. To accomplish this, a valve connects the inside of the vessel with attached interlocking spacers mounted on the door. This valve cannot be closed unless the locking ring is properly seated. The door itself is carried on anti-friction bearings for ease of operation.

PORTABLE SEARCHLIGHT

VERSATILE in application, the new Big Beam No. 411 portable electric hand searchlight made by the U-C Lite Mfg. Co., Chicago 11, Ill., is said to project an intense beam for more than 2,500 ft. or, by means of a snap-on lens, to give the same volume of light over a wide area. The new searchlight is powered by a heavy duty 6-volt storage battery, rechargeable from any a.c. changer, d.c. line or light plant. For recharging it is not necessary to remove the battery from the container. The lamp head can be turned in any direction, staying so adjusted. The unit may be carried by hand or with a shoulder strap.

Searchlight showing charging arrangement

COPRA REFINING

COPRA as received at processing mills in the United States normally contains about 4 to 5 percent moisture. It is unloaded from the cars and blown to large storage silos having a capacity of several thousand tons. It may be stored safely, at a 5 percent moisture content, for an indefinite period. Copra from the silos or directly from the cars is tumbled from a conveyor over a magnet to remove all tramp iron. It next passes through a copra breaker to reduce the size, is weighed in automatic dump scales, and ground in a vertical type hammer mill.

The uniformly ground material passing approximately a 10-mesh screen is treated in large expeller cookers and conditioners to reduce it to optimum temperature and moisture for pressing. The process is continuous. The material passes on to expellers or screw presses for expression of the oil. The cake from modern expellers normally contains about 4.5 to 5.5 percent oil and under the above condition of operation, a ton of copra normally yields about 1,250 lb. of oil and 720 lb. of cake. The expeller cake is ground continually in an attrition mill, passed through a meal cooler, screened, weighed and transferred to bulk or sacked meal storage.

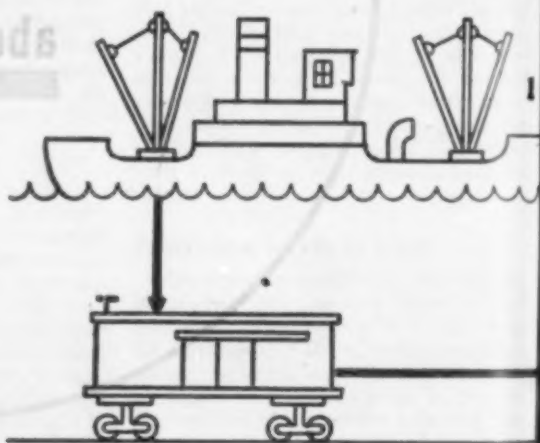
The expeller oil is screened to remove meal solids and then passed through a filter press to remove final traces of meal. The resulting product is normal crude coconut oil. It contains from 1 to 12 percent free fatty acid depending on the quality of the copra meats from which it was produced.

Only those oils of low free fatty acid content produced from sound copra are used for edible purposes. Oil of high free fatty acid is used for the production of soap, alcohols and similar uses.

Crude coconut oil is generally refined with caustic to remove free fatty acid in large agitated kettles. The temperature is about 110 deg. F. with an excess of caustic varying from 25 to 50 percent. After settling, the oil is decanted from foots and dried. The oil is then transferred to an agitated tank and bleached with earth and carbon at a temperature sufficient to have the oil dry (well over 212 deg. F.) to produce a practically water-white oil. The bleaching agents are removed from the oil by means of filtration through mechanical filters.

Refined and bleached coconut oil to be used in edible products is deodorized in large high-vacuum stills. De-aerated, super heated steam is blown through the oil at high-vacuum to remove all traces of volatile materials. The resulting product is a water-white, perfectly bland flavored oil.

Coconuts are towed to market by the Philippine nati dugouts. Round rafts prevent lodging along jungle-fringed



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FLOW
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CHEMICAL & METALLURGICAL
ENGINEERING

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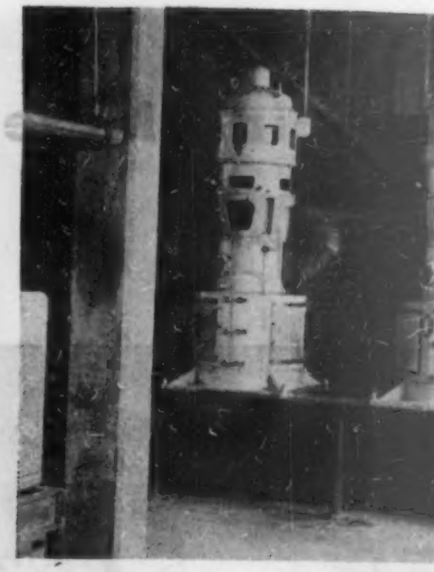
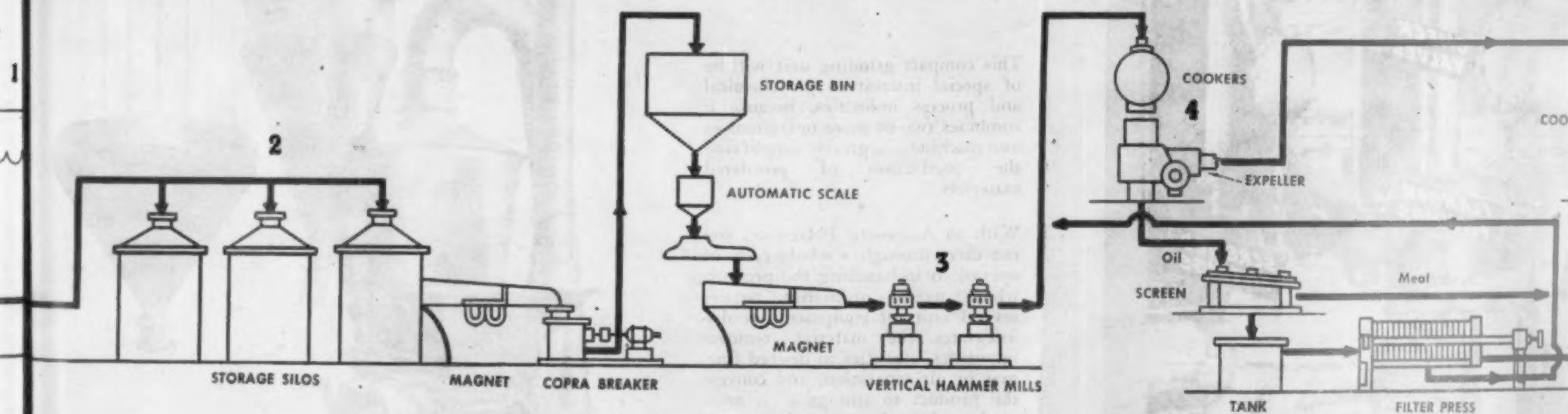
Coconut meat dried under a tropical sun becomes copra of commerce. It is an important export of the South Sea Islands

1 Copra also is shipped to the United States from Jamaica and other islands in the West Indies where it is a basic crop

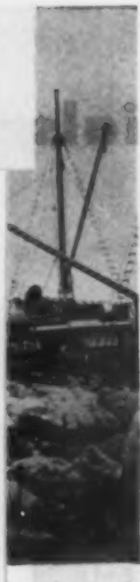


3 From the silos the copra is passed over
is weighed in automatic dump scales, an

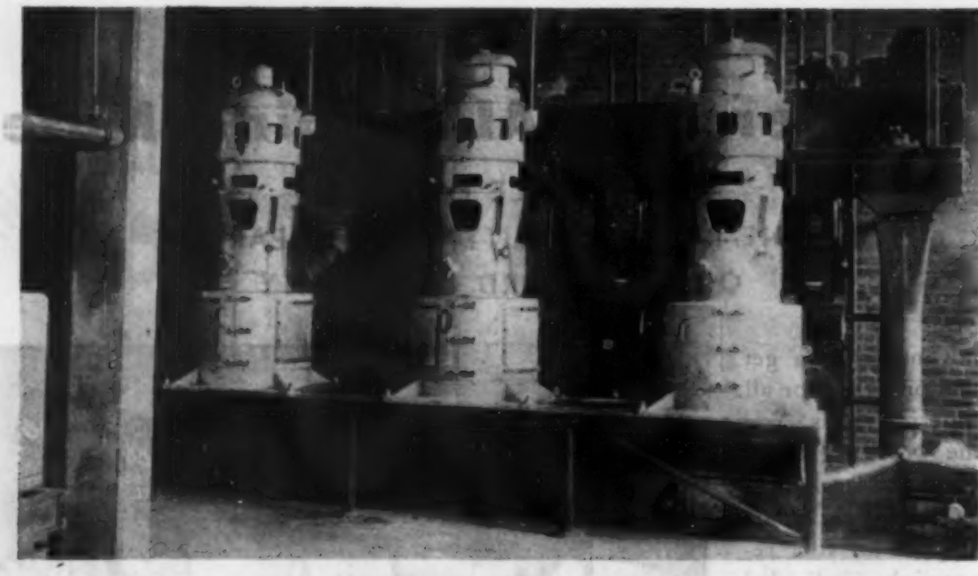


2 On arrival at the refining plant in the United States the copra is blown to large storage silos. It may be stored safely at a 5 percent moisture content for an indefinite period

4 The uniformly ground material passing approximately a 10-mesh screen is treated
cookers and conditioners shown to reduce it to optimum temperature and mois

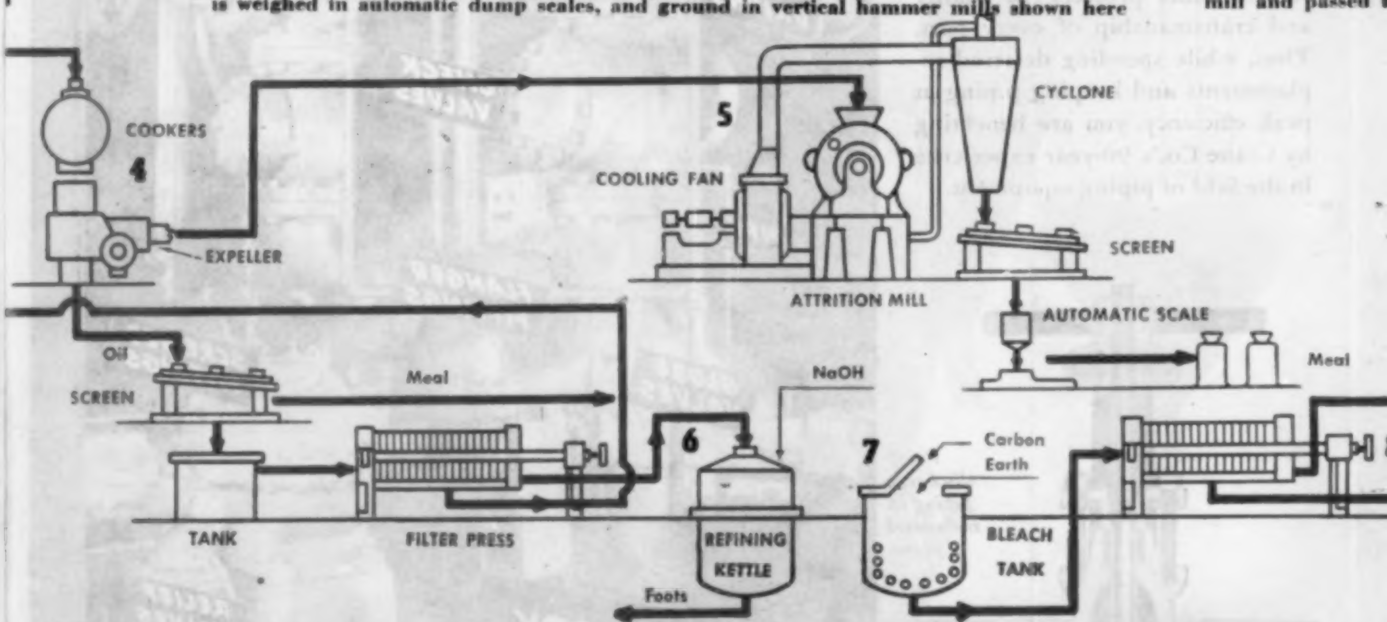


[J]amaica and



3 From the silos the copra is passed over a magnet to remove iron, and over a breaker, is weighed in automatic dump scales, and ground in vertical hammer mills shown here

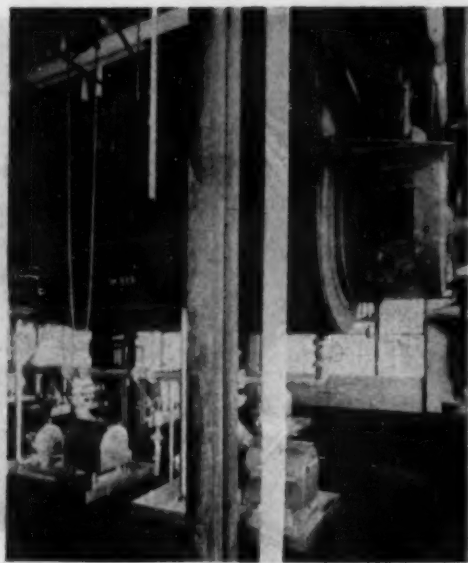
5 Expeller cake i[s] ... mill and passed t[o] ...



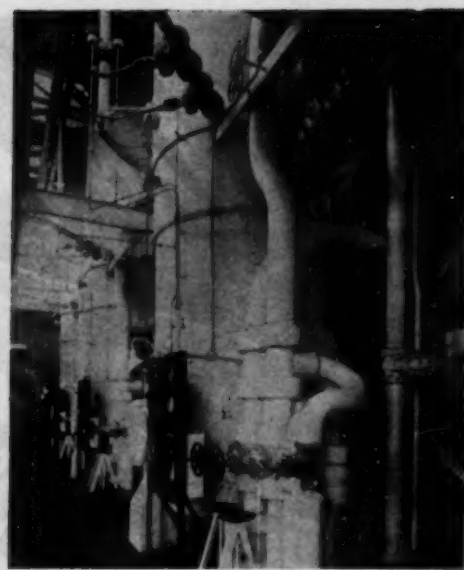
[Gr]ound material passing approximately a 10-mesh screen is treated in large expeller [cook]ers shown to reduce it to optimum temperature and moisture for pressing

6 Crude coconut oil is generally refined [w]... large agitated kettles. A temperature of 110...

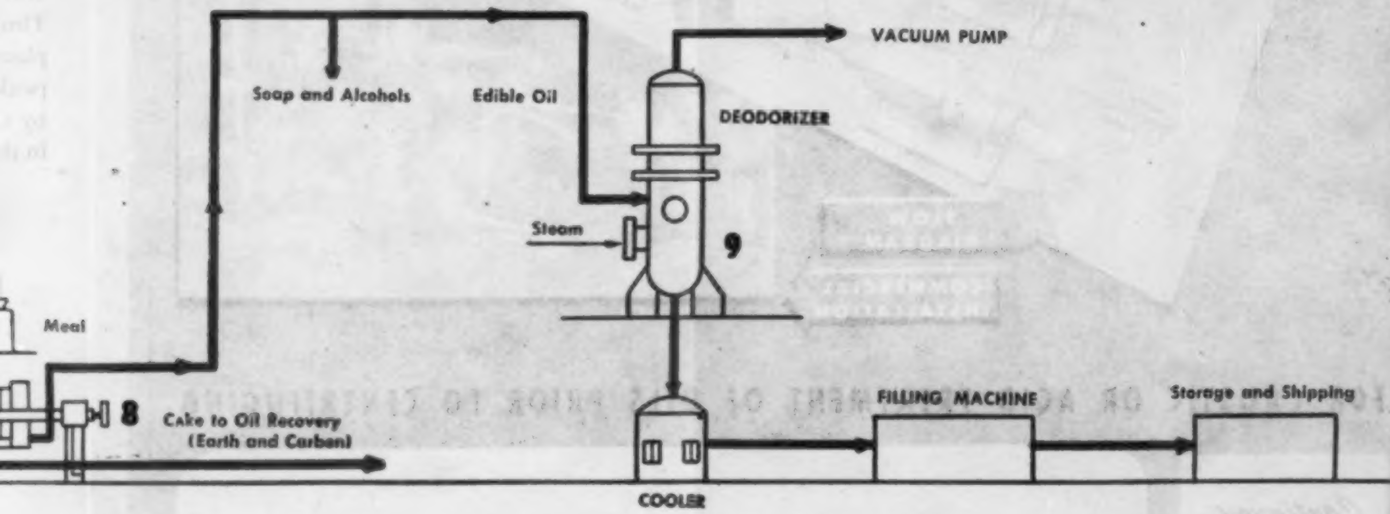
...peller cake is ground in an attrition ...nd passed through a cooler



7 Oil is bleached with activated earth and carbon at a temperature of 212 deg. F.

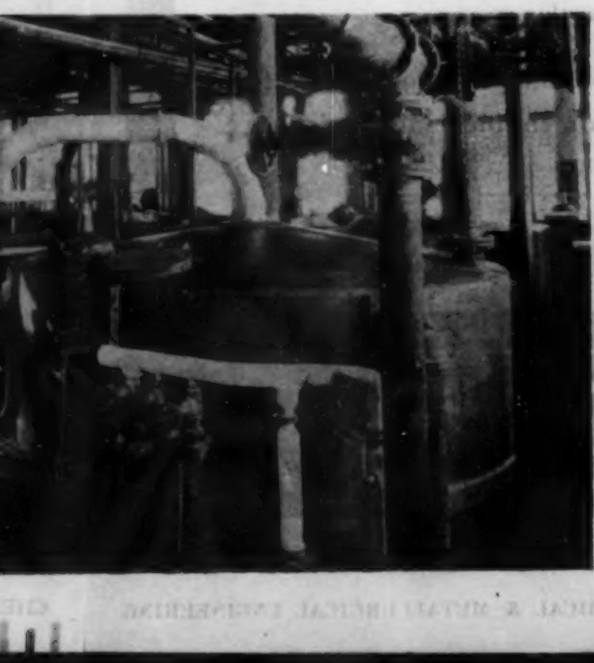


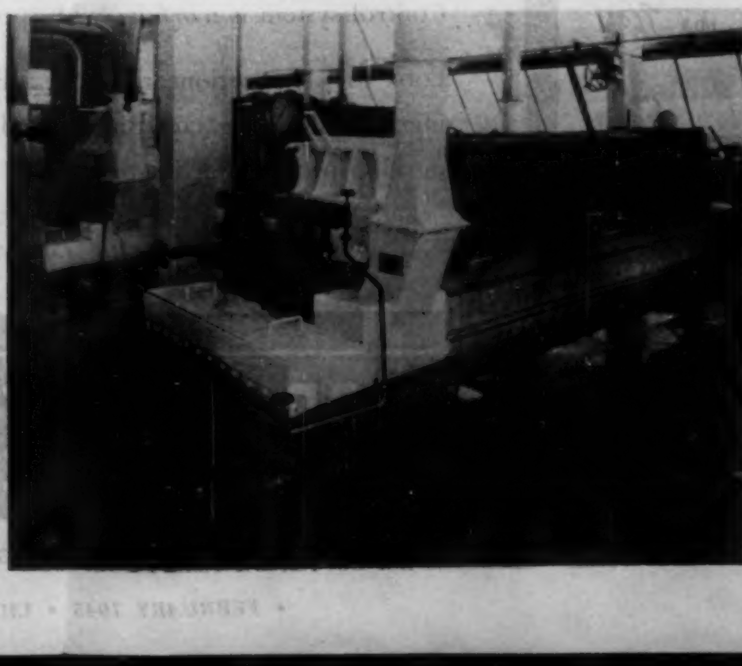
9 Oil for edible products is deodorized in large vacuum stills



...lly refined with caustic to remove free fatty acids in ...ature of 110 deg. F. is used

8 Bleaching earth and carbon are removed from the water-white oil by means of filtration as shown in the accompanying photograph





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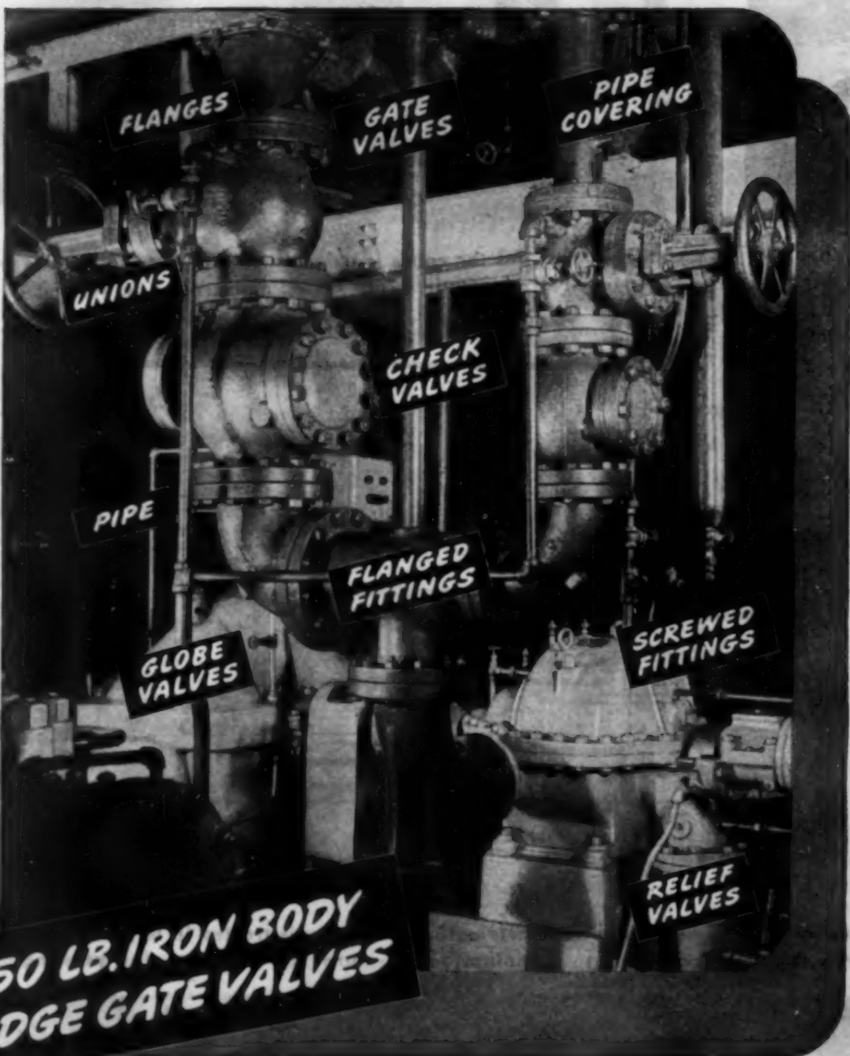
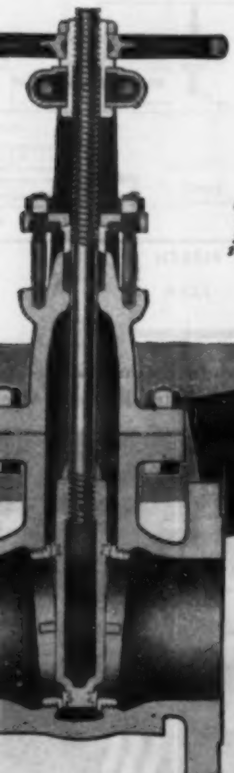


Pump discharge piping in industrial plant.



SERVICE RECOMMENDATIONS: Crane 250-lb. Iron Body Wedge Gate Valves are recommended for services too severe for Standard valves but where the use of steel valves is not justified. Available in all-iron or brass-trimmed; in O. S. & Y. or Non-Rising Stem patterns. With screwed ends up to 4 in.; flanged ends up to 12 in. See your Crane Catalog for complete specifications.

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NEW PRODUCTS AND MATERIALS

JAMES A. LEE, Managing Editor

DIBASIC ACID FOR RESINS

DEVELOPMENT of a new dibasic acid has been announced by the Heyden Chemical Corp., New York, N. Y. Known as M.D.A., it is a technical grade of methylene disalicylic acid (dihydroxydiphenylmethane dicarboxylic acid). It consists of a mixture of isomers, principally the para-para. In addition, other isomers as well as small amounts of low molecular weight polymers are probably present.

Since it contains, in a single molecule, both the reactive carboxylic acid groups and the phenolic groups, M.D.A. combines the versatility of alkyd type resins with the chemical resistance of phenolic types. For example, it has been found that alkyd resins made with M.D.A. and a pentaerythritol alcohol overcome the poor alkali resistance of ordinary alkyds. According to the company, when varnishes are formulated with these resins, the resulting products are improved rapid-drying protective coatings. M.D.A. may also be used with rosin and pentaerythritol alcohol to produce modified phenolic resins which can be cooked into varnishes by the usual methods to produce fast-drying paints and varnishes of improved chemical resistance.

Because of the tight supply positions of other dibasic acids M.D.A. is of special interest at the present time to manufacturers of paints, varnishes, protective coatings, printing inks, and linoleum.

Properties of M.D.A.

Appearance	Buff-colored powder
Combining wt.	150
Apparent density, lb./cu. ft.	36.8
Melting range, deg. C	200-230
Solubility, 25 deg. C.	
Soluble in methanol and acetone	
Insoluble in water and petroleum hydrocarbons	
Containers: 250-lb. wooden bbl. with paper liners	

VULCANIZING AGENTS

COMMERCIAL quantities of the alkyl phenol sulphides are being offered to the rubber industry as active primary vulcanizing agents under the trade name Vultac by Sharples Chemicals, Inc., Philadelphia, Pa. The Vultacs are available in three modifications and may be used most advantageously in compounding GR-S and the various buna-N copolymers. They are not recommended for other types—natural, Neoprene, butyl—since elemental sulphur works just as well or better. But as a source of sulphur for vulcanizing GR-S and buna-N they are said to possess two important advantages over sulphur itself. First, they are readily soluble in these synthetics whereas elemental sulphur is not, and second, in the case of GR-S they serve the added function of imparting tack.

Their solubility in the butadiene polymers results in easier mixing, better dispersion, and more uniform vulcanization. Uniform vulcanization, in turn, is said to result in stocks possessing marked superiority in the following respects: improved retention of tensile strength and elongation after extended cure or severe aging; lower "marching modulus" upon aging; outstanding resistance to heat; and outstanding resistance to flex cracking and tear, both before and after aging and at elevated temperatures.

Use of the Vultacs imposes no difficulties in processing. In fact, when added in the early stages of mixing, they serve as processing aids, reducing the nerve of the rubber and giving a pliant smooth-rolling stock, and at the same time improving the dispersion of fillers and pigments. Stocks can be processed safely under the usual conditions, and tests have shown that the same general curing conditions employed for sulphur stocks are applicable to those compounded with the Vultacs.

Range of Properties Exhibited by Vultac Nos. 1, 2, and 3

Appearance	Brown resins, soft to hard
Types of alkyl phenol sulphide	Monosulphide and disulphide
Sulphur content, percent	13 to 28
Sp. gravity, 25/25 deg. C.	1.11 to 1.20
Weight, lb. per gal	9.3 to 10.0
Softening pt., ASTM E28-36T, deg. C.	45 to 80
Solubility, Vultac No. 1	Readily soluble in all common organic solvents
Solubility, Vultac Nos. 2 and 3	Readily soluble in all common organic solvents except alcohols

SHOE SOLING MATERIAL

A COMPLETELY new material for shoe soles—neither leather, rubber, fabric, nor plastic—has been announced by the Goodyear Tire & Rubber Co., Akron, Ohio, under the trade name Neolite. In many of its properties it is quite similar to leather. It furnishes a firm platform for foot protection, retains its shape and flatness on the bottom of the shoe, is used in the same thickness and has the same weight as leather, stitches well, has a good appearance and works satisfactorily on shoes made with cemented-on soles. These essential attributes of a good shoe bottom are found in leather but, according to the Goodyear Co., have never before been duplicated by a manufactured material. Rubber soles, for example, do not provide a permanent platform for the foot, do not continue to hold their shape, and are too heavy in weight. Plastics are growing in importance but the product tends to crack under certain conditions, does not hold stitches as well as it should, and has not been made successfully in the proper thickness.

Neolite, on the other hand, is said to possess all the requisite characteristics of leather and in addition many qualities which leather lacks. Most important, it wears much longer than leather and is permanently impervious to moisture. Greater comfort, better grip on the pavement, and more positive insulation against heat and cold are also claimed. Finally, it is more uniform in quality and is not subject to wide variation in cost. In relation to other materials in the shoe market, it is expected that leather and Neolite will be companion products for adults' and children's street and dress shoes, while rubber will continue to grow in the sports- and work-shoe fields.

GLUE FOR WOOD BONDING

A COLD-SETTING, phenolic resorcinal resin glue, designated XC-17613, has been introduced by the Bakelite Corp., New York, N. Y., for use in wood bonding. It is said to provide maximum water resistance and durability for exterior plywood, laminated lumber, beams, trusses and ships' keels. Widely used for bonding wood structures by means of clamps, jigs, or bending forms, it is also recommended for aircraft or marine assembly work or any other application that demands a permanent, non-acid phenolic resin glue for application at room temperature. The new glue is said to be ideal where heavy glue lines are likely to occur or where it is necessary for glue to fill gaps in improperly fitted joints. It has an extremely high degree of specific adhesion and will bond ordinary medium density woods, like poplar and mahogany, at contact pressures. Because of this property it is particularly well suited for bonding furniture and cabinet joints.

The liquid resin supplied by the maker must be mixed with a hardener, but mixing should not be done until just before

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using. Useful life of the glue mix is shortened from 4½ hr. at 70 deg. F. to ¾ hr. at 100 deg. F., making it advisable to keep glue room temperatures as low as possible. In gluing heavy timbers, for which XC-17613 is particularly adapted, it is recommended that double spreading be employed, using grooved rubber rollers or a glue gun for best results. Assembly time varies with the weight of glue spread and with glue room temperature. At 80 deg. F. and with 50 lb. glue per 1,000 sq.ft. (a typical situation), the minimum open assembly time is 10 min., max. open is 75 min., and max. closed is 85 min.

Curing temperatures below 70 deg. F. are not recommended. At that temperature the minimum clamping time for high-density wood is 20 hr., at 90 deg. F. it is 8 hr., and at 110 deg. F. it is 3½ hr. Low-density wood need be kept in the clamps only one half to a third as long. While these times are sufficient to permit removal of retaining clamps, a conditioning period of 24 to 96 hr. is required to attain full mechanical strength and water resistance.

Lumber having a moisture content of 12-15 percent can be successfully bonded, but variations in excess of 3 percent from layer to layer should be rejected. Accelerated aging tests indicate that the resin may be held in storage in closed containers at least for several months at temperatures below 70 deg. F., but until field tests have been concluded the company recommends that purchases be limited to two months' supply. Danger from dermatitis is slight if cleanliness, ventilation, and good personal hygiene are maintained.

Properties of XC-17613

Appearance	Reddish-brown liquid
Sp. gravity, 77 deg. F.	1.192
Weight, lb. per gal.	9.75
Flash pt., min. deg. F.	105
Viscosity, kv.	200-300
Solvents	Denatured alcohol
Thinner	Denatured alcohol
Filler	None

BACTERICIDE

In many of the sterilizing solutions used by U. S. Navy surgeons is a bactericide known as Hyamine 1622, produced by Rohm & Haas Co., Philadelphia, Pa. It is a pure quaternary ammonium salt* characterized by high germ-killing power and unusual stability under difficult storage conditions. It is said to differ from many older disinfectants in that it is more effective against Gram positive organisms than against the standard Gram negative E. Typhi.

Hyamine 1622's potency against germs is exhibited in a 3-percent aqueous solution now being distributed widely in the drug field as a topical antiseptic for cuts and abrasions. A number of proprietary antiseptic washes, gargles, after-shave lotions, and shampoos owe their efficacy to similar "bland" solutions of Hyamine 10-X (a modified form of 1622).

Availability of the Hyamines in the fields of medicine and pharmacy is regulated by a patent license agreement, but both Hyamines are available in many other fields, including industrial sanitation, veterinary medicine, food processing, and farm sanitation. In addition, they present a possible means of disinfecting mushroom plants to prevent contamination of the spores, and their algaecidal properties suggest their use as slime preventatives on swimming pools.

Three prime characteristics are said to give the new product a marked advantage over chlorine products for sanitizing utensils and equipment in dairies, breweries, tanneries, and other food processing plants, and in establishments where dishes and silverware are used. (1) It is odorless, and does not react upon or embrittle rubber or tarnish silver at concentrations used. (2) It rinses off well and does not affect plastic, metals, glass or ceramic ware. (3) Hyamine 1622 is effective in more dilute solutions than are organic chlorine-liberating compounds recommended for germicidal rinses. The latter, moreover, decrease in efficiency upon standing in solution through volatilization of the bactericide, whereas Hyamine solutions gain in strength rather than lose, because Hyamines are not volatile.

* Technically, it is di-isobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.

WATERPROOF INSULATION

For a number of years the Monsanto Chemical Co., St. Louis, Mo., has produced an insulating material called Santocel which weighs as little as 3 lb. per cu.ft. and has about half the thermal conductivity of cork. It is a derivative of silica, it pours like water, and it looks like finely ground snow. In a cupful are literally millions of dead air pockets which act to slow the transmission of heat.

Heretofore Santocel's vulnerability to water has narrowed its usefulness as an insulating agent. But by a new process Monsanto has succeeded in water-proofing Santocel, making it useful as insulation between quilted layers of fabric designed for outdoor use. Such blankets and sleeping bags are said to weigh but a few ounces, yet afford greater warmth than heavy furs and woolens. The chemical used to make Santocel water-repellent is one of the silicones developed by General Electric Co. and described in *Chem. & Met.*, Dec. 1943, p. 137. Other prospective users of waterproofed Santocel include the manufacturers of hunters' coats, life jackets, and life rafts.

MODIFIED BUNA-S LATEX

A new synthetic rubber latex has been developed and is in production by the U. S. Rubber Co. at the government's synthetic latex plant at Naugatuck, Conn. A modification of the butadiene-styrene type of synthetic rubber, the new latex has the advantages of greater uniformity and easier handling and shipping. It mixes well with other ingredients and is therefore very easily compounded for uniform viscosity and other desired properties. It is said to be a superior product for saturating paper and fabrics for artificial leather, for backing pile fabrics for upholstery and carpets, for binding vegetable fibers and animal hair in upholstery, and for solutioning or dipping tire cord with synthetic rubber latex. The new latex is said to give greater uniformity of physical properties in most finished products, but it admittedly is not yet the equal of natural rubber latex in thin-wall dipped goods.

BUTADIENE MONOXIDE

Otherwise designated as 3,4-epoxy-1-butene, or vinylethylene oxide, this new organic compound is a colorless, relatively volatile liquid possessing both carbon-to-carbon unsaturation and an alpha-epoxide group. It undergoes a variety of reactions characteristic of these two organic groups, rendering it useful in diverse organic processes such as the production of polymerizable alkyd resins and the production of unsaturated alcohol ethers and esters.

Properties of Butadiene Monoxide

Formula	C_4H_6O
Molecular weight	70.1
Sp. gravity, 24/4 deg. C.	0.8693
Vapor pressure	
at 0 deg. C., mm. Hg	44
at 24 deg. C., mm. Hg	144
Boiling pt., 760 mm. Hg, deg. C.	66
Freezing pt., max. deg. C.	—85
Flash pt., max. deg. C.	—50
Refractive index, n20D	1.4170
Latent heat vaporization, cal. per gm. at 760 mm. Hg	116
Solubility at 25 deg. C. in	
alcohol, acetone, ether, ethyl acetate, chloroform, benzene, petroleum ether	Miscible
water, % by wt.	6
ethylene glycol, % by wt.	22

PLYWOOD ADHESIVE

Hardwood plywood manufacturers will welcome the announcement of Amberlite PR-245, a new adhesive manufactured by Resinous Products & Chemical Co., Philadelphia, Pa. This is a thermosetting phenol-formaldehyde resin in dry powder form which is readily soluble in water, alcohol and mixtures of the two. It is said to possess the multiple virtues of outstanding durability in the bonding of all commonly used hardwood species, short assembly times, moderate flow during cure, fast cure at usual bonding conditions, and ability to cure at temperatures as low as 160 deg. F.

Obvious advantage of the fast-curing property is that it substantially increases the output of a hot press and thereby lowers the glue line cost. The accompanying table shows the time required to bond plywood assemblies of varying thickness.

Plywood Bonding Schedule*
Amberlite PR-245 with Catalyst Q-108

Total Thickness of Assembly (Including Cauls)	Plate Temp., deg. F. 240	320
	Min. Under Full Pressure	
⅛ in.	6	1.75
¼ in.	8	3.5
½ in.	12.5	7.5
1 in.	24	17.5
1 1/16 in.	30	22

* Standard plywood constructions, all veneer layers.

From 25 to 45 lb. of liquid glue is normally required to spread 1,000 sq.ft. of glue line, and either single or double spreading may be employed. Permissible time limits in assembling range from a minimum closed assembly period of 30 min. to a maximum open interval of several days, permitting a very flexible spreading and pressing schedule in the plant. Moisture content of the veneer may range from 4 to 10 percent with no change in properties of the bond. Moderate flow

properties tend to eliminate starved joints which are often caused by insufficient assembly time or high moisture content veneers.

Apart from its use in the manufacture of plywood, Amberlite PR-245 seems well adapted for laminating heavy timbers where higher bonding temperatures are unobtainable and where durability is a prime requisite. An average spread of 80 lb. of glue mix per 1,000 sq.ft. of glue joint is suggested and should preferably be applied by double spreading. In closed assemblies, the permissible time limits for assembling are between ½ hr. minimum and 2½ hr. maximum before pressure is applied. As in the case of plywood, a catalyst is used to accelerate bonding, and a basic rule is that for Douglas fir and softwoods the glue line farthest removed from the heat source should be held at 160 deg. F. for 9-10 hr. For white oak a clamping period of 9-10 hr. at 190 deg. F. is satisfactory.

WATER EMULSION ADHESIVES

Developed to meet water immersion tests of Army and Navy packaging specifications, four newly improved, emulsion-type adhesives of Paisley Products, Inc., Chicago, Ill., are currently being used in Army depots and war plants whose packaging must conform to such typical specifications as JAN-A-101, C.W.S. No. 197-54-398, and U.S.A. No. 100-14A. All four types are non-flammable, free from objectionable odors, and dilutable with water. When used on asphalt laminated and impregnated papers and V-board, the fast breaking emulsion quickly penetrates paper fibers and releases the resin film as the water-insoluble bonding agent. When completely dry the adhesive film is resistant to extremes of heat, cold, humidity, and to complete water immersion.

Paisley No. 3130, a reclaimed rubber and resin emulsion with retack features, is designed for quick bonding of case liner and waterproof bag stocks. No. 4016, an asphalt and rubber emulsion with retack features and medium fast setting time, is best suited for hand brush application to large case liners and bags. No. 676, a vinyl polymer emulsion, is used for fast hand or machine sealing of V-boxes, small cartons, case liners and bags. No. 688 is a vinyl polymer-starch adhesive for hand brush sealing of cases and V-board cartons where good suction is necessary and final drying is accomplished under pressure.

ETHYL α-OXALPROPIONATE

This intermediate, or starting point, for organic synthesis has recently been made available in research quantities by U. S. Industrial Chemicals, Inc., New York, N. Y. It is prepared by condensing diethyl oxalate with ethyl propionate in the presence of sodium ethoxide. It may also be synthesized from ethyl sodium oxalacetate and methyl iodide. Like other new Claisen condensation products, ethyl alpha-oxalpropionate appears to have many as yet unexplored uses as a synthesis intermediate. Some of the possibilities are suggested by the following reactions:

On distillation it loses carbon monoxide to give diethyl methylmalonate. On heat-

ing with ammonia it forms alpha-methyl-beta-iminosuccinimide. On boiling with alcoholic KOH it breaks down to propionic acid, oxalic acid, and alcohol. On heating with ethyl iodide and sodium ethoxide it yields alpha-methyl-alpha-ethyl-oxalpropionic ester. On heating with dilute sulphuric acid it gives propionylformic acid (alpha-oxobutyric acid), alcohol, and carbon dioxide. On hydrogenation it gives diethyl alpha-hydroxy-beta-methyl-succinate, which upon further hydrogenation forms 3-methyl 1, 2-butanediol, and 2-methyl 1, 4-butanediol, and alcohols and water. On dissolving in alcoholic solution it gives an intense red color with ferric chloride.

Properties of Ethyl a-Oxalpropionate

Appearance	Light-yellow to colorless liquid
Formula	$CH_3CHCOOC_2H_5$ / $COCOOC_2H_5$
Molecular wt.	202
Sp. gravity, 20/20 deg. C.	1.0077
Boiling pt., 5.5 mm. Hg. deg. C.	108–109
Refractive index, 20 deg. C.	1.433

MOLD SPRAY FOR FOUNDRY USE

DEVELOPMENT of a solvent type mold spray for use in the production of steel, iron, and nonferrous castings has been announced by Hercules Powder Co., Wilmington, Del. Made of a resin dissolved in a quick-burning solvent, Truline Mold Spray 91 is applied to a sand mold with spray gun, can, or paint brush and is then ignited and allowed to burn off the mold. Upon burning, it leaves a thin film of resin on the mold, thus guarding against loose sand falling into the drag while a core is being set and the mold closed. Molds are useable immediately after being burned off. Because it strengthens, hardens, and dries the mold surface, the new spray is said to materially reduced the number of castings rejected because of burned out binders and green spots in the mold.

WATER MISCIBLE SOLVENT

SALIENT characteristics of a new solvent produced on a pilot plant scale by Monsanto Chemical Co., St. Louis, Mo., are the wide range of its solubility and the fact that it is miscible with water. Gamma valerolactone (GVL for short) is a colorless, mobile liquid having the formula $C_5H_8O_2$. It is miscible with most organic solvents and plasticizers and with resins, waxes, oils, fats and acids, except anhydrous glycerin, polyvinyl alcohol, glue, casein, gum arabic and soybean protein. It is slightly miscible with zein, degras, beeswax, petrolatum, and mineral spirits. Possible uses include the following: as a coupling agent in dye baths, in brake fluids, in cutting oils, as a solvent for insecticides and fungicides, as a lacquer solvent to reduce blush, and as a solvent for adhesives.

Properties of Gamma Valerolactone

Molecular weight	100.06
Sp. gravity, 25/25 deg. C.	1.0518
Boiling pt., 760 mm. Hg, deg. C.	205–206.5
Crystallizing pt., deg. C.	—37
Flash pt., Cleve. open cup, deg. F.	205
Fire pt., Cleve. open cup, deg. F.	220
Refractive index, 25 deg. C.	1.4301
Surface tension, 25 deg. C., dynes/cm	30
Viscosity, 25 deg. C., centipoises	2.18
pH, anhydrous	7.0
pH, 10% sol. in distilled water	4.2

CHEMICAL ENGINEERING NEWS

TEXTILE RESEARCH INSTITUTE WILL SPEED ACTIVITIES

The board of directors of the Textile Research Institute, Inc., has notified the membership by letter that a decision has been reached to go ahead vigorously with a program of fundamental and applied research. It has recommended that the building at Princeton, N. J. be made ready at the earliest possible moment for occupancy by the research workers. It further has proposed that the magazine *Textile Research* be continued as a scientific journal. These decisions were reached following the submission of a report of the special survey committee which had been appointed last fall.

It was announced that the board had accepted with regret the resignations of Fessenden S. Blanchard, president and Douglas G. Woolf, vice president. These men have been asked to continue on the staff until the end of next June, Mr. Blanchard to devote his time to membership work and Mr. Woolf to direct the economic study being conducted at Princeton for the Textile Foundation. Harold DeWitt, former vice president was appointed president. Dr. Henry Eyring will continue in charge of fundamental research; Julian S. Jacobs will be in charge of publications; and Major D. B. MacMaster will be office and personnel manager.

LABORATORY MEN ELECT OFFICERS FOR 1945

The annual meeting of the American Council of Commercial Laboratories was held at the Palmer House, Chicago, on January 15–16. At the business session officers for the ensuing year were elected as follows: Major W. P. Putnam, Detroit Testing Laboratory, Detroit, president; H. L. Sherman, Skinner & Sherman, Inc., Boston, vice president; T. A. Wright, Lucius Pitkin, Inc., New York, treasurer; and Dr. B. L. Oser, Food Research Laboratories, Long Island City, secretary. Members of the executive committee include the officers and J. H. Herron, James H. Herron Co., Cleveland; Dr. R. W. Truesdail, Truesdail Laboratories, Inc., Los Angeles; Dr. A. C. Purdy, Bull & Roberts, New York; and A. R. Ellis, Pittsburgh Testing Laboratory, Pittsburgh.

PHILLIPS PETROLEUM GIVES SAFETY COURSE TO WORKERS

Recently Phillips Petroleum Co. added eight men to its safety department and put all its safety personnel through a comprehensive safety course. The company arranged through Lowell C. Brown of Oklahoma University for a special 72-hr. safety engineering course and with G. M. Kintz of the U. S. Bureau of Mines for the Bureau's 20-hr. gas course. Dividing the school into two six-day sessions allowed the trainees an opportunity to digest their new information during a two-week interim. Six hours of classes were conducted for six days during each of the two sessions.

NEW RESEARCH BOARD FOR DEVELOPMENT OF WEAPONS

Set up at the request of the armed services, a board of civilian and military scientists has been established to develop weapons for any future conflict. It will be called the Research Board for National Security and will serve in the interim between the expiration of the present Office of Scientific Research and Development and the establishment of an independent agency. It is made up of 20 civilian scientists and an equal number from the Army and Navy.

The announcement, made by Secretaries Stimson and Forrestal and Dr. Frank B. Jewett, president of the National Academy of Sciences, stated that to insure continued preparedness along far-sighted technical lines, the research scientists of the country must be called upon to continue in peacetime some substantial portion of those types of contribution to national security which they have made so effectively during the stress of the present war.

Civilian members of the board are: Karl T. Compton, Massachusetts Institute of Technology, chairman; Roger Adams, University of Illinois; A. R. Dochez, Columbia University; E. K. Bolton, E. I. du Pont de Nemours & Co.; O. E. Buckley, Bell Laboratories; Bradley Dewey, Dewey & Almy Chemical Co.; Lee Du Bridge, University of Rochester; H. S. Gasser, Rockefeller Institute; A. Baird Hastings, Harvard University; J. C. Hunsaker, National Advisory Committee on Aeronautics; W. S. Hunter, Brown University; Zay Jeffries, General Electric Co.; C. C. Lauristen, California Institute of Technology; E. O. Lawrence, University of California; Linus Pauling, California Institute of Technology; H. W. Prentis, Jr., Armstrong Cork Co.; I. I. Rabi, Columbia University; E. C. Stakmen, University of Minnesota; Oswald Veblen, Princeton University; and Lewis H. Week, Johns Hopkins University.

PORTABLE PRODUCTS CORP. BUYS TAGLIABUE

The Portable Products Corp., Pittsburgh, has purchased the assets including goodwill, name and patents of the C. J. Tagliabue Mfg. Co. of Brooklyn. Research and development policies will be continued under the management and personnel of Tagliabue and the business will be operated as a separate division of the Portable Products Corp.

INDUSTRIAL EXECUTIVES TO ADVISE ON STANDARDS

A committee of eight industrial executives with Charles E. Wilson, president of General Electric Co. as chairman, has been appointed by the Secretary of Commerce to advise the Department of Commerce and the American Standards Association on future plans for standards work. This appointment is the first action to come out of a conference of 50 business leaders held in New York on January 12 at the invitation of the Secretary of Commerce to make recommendations to him in regard to the relative roles which should be played by government and industry in standards activities.

Serving with Mr. Wilson on the committee are Frederick M. Feiker, dean of engineering, George Washington University; Clarence Francis, chairman of the board, General Foods Corp.; Ephraim Freedman, R. H. Macy & Co., Inc.; Frank B. Jewett, president, National Academy of Sciences; William B. Warner, president, McCall Corp.; Arthur D. Whiteside, president, Dun & Bradstreet, Inc.; and R. E. Zimmerman, vice president, U. S. Steel Corp.

HERCULES FORMS SUBSIDIARY IN GREAT BRITAIN

Announcement was made last month by Hercules Powder Co. that the company had created a subsidiary for the distribution of technical information on its chemical products in Great Britain and Eire. The new branch, Hercules Powder Co., Ltd., will have offices at 140 Park Lane, London and will be under the management of Cornelius H. B. Rutteman, managing director. Directors of the subsidiary are Thomas H. Cooks, manager of Holden Vale Mfg. Co., a partly owned subsidiary of Hercules; R. H. Oxley, manager of the London branch of the Bankers Trust Co.; Kenneth D. Cole, member of the firm, Messrs, Linklaters & Paines, solicitors; and Cornelius H. B. Rutteman.

The London office will administer the company's English business and assist customers and local distributors with data and technical service on the use of Hercules products. Manufacturing operations of the Hercules Paper Makers Chemical Department will be continued at Erith, Eng.

MIDWEST RESEARCH INSTITUTE ADOPTS PROGRAM

Following a meeting of the trustees held at Kansas City, Mo., on February 5, at which time an extensive research program was outlined, the Midwest Research Institute is now ready for full-scale production. Harold Vagtborg, former director of Armour Research Foundation,

Chicago, took over his duties as president of the Institute at the beginning of the year. The laboratories of the Institute have been employed in the study of a number of projects but are being equipped and expanded to give facilities for all research demands.

Members of the staff which will work under Dr. Vagtborg include Dr. George E. Zeigler, former scientific advisor to Armour who will direct the Institute's relationships with educational institutions; Dr. George W. Ward, former supervisor of Armour's ceramic industrial materials research; Dr. C. L. Shrewsbury, of the Agricultural Experiment Station, Purdue University; Dr. Elza O. Holmes, formerly of the Military Chemical Works, Pittsburg, Kansas; Dr. Frank M. Trimble, former co-chairman of the physics research department at Armour; Dr. F. E. Horan, of Columbia University; M. N. Schuler, University of Kansas; Miss Jane Hathaway, Bradley Polytechnic Institute; and Miss Margaret Gill, Vanderbilt University.

BARBER ASPHALT CORP. WILL CHANGE CORPORATE NAME

Directors of the Barber Asphalt Corp. have recommended that stockholders at their meeting scheduled for May 9, consider changing the name of the corporation to the Inter-American Oil Corp. It is stated that the corporation's major interest in the future will be in oil although large scale importation of asphalt from Trinidad will be resumed after the war. In view of the greater importance of oil in the organization's business, it was held that the change in name would be more descriptive of operations.

CHLORINE INSTITUTE HOLDS ANNUAL MEETING

The annual meeting of The Chlorine Institute, Inc., was held in New York on January 24. Various committee reports were submitted and the following directors were elected for two-year terms: Thomas Coyle, E. I. duPont de Nemours & Co., Inc.; W. I. Galliher, Pittsburgh Plate Glass Co.; Louis Neuberg, Westvaco Chlorine Products Corp.; B. P. Steele, Pennsylvania Salt Mfg. Co.; and Eli Winkler, Southern Alkali Corp. Following this session, the board of directors met and reelected these officers: S. W. Jacobs, president; E. C. Speiden, vice president; and Robert Baldwin, secretary and treasurer.

MONSANTO PLANS TO EXPAND PRODUCTION OF MELAMINE

Last month Monsanto Chemical Co. announced that it was about to begin volume production of melamine which has been found to have a wide range of wartime applications as well as almost limitless peacetime possibilities. A new production unit is under construction at the company's plant at Everett, Mass., where the chemical is now being produced in pilot plant quantities. Monsanto owns the basic patent on melamine formaldehyde resins

MEETINGS AND CONVENTIONS CANCELLED OR POSTPONED

Complying with the recommendations of the Office of Defense Transportation, many organizations already have reported the cancellation of meetings and conventions which had been scheduled to be held this year. This action was taken to conserve transportation and hotel accommodations. Other organizations have this matter up for consideration. Among the cancellations or postponements are:

American Chemical Society
American Foundrymen's Association
American Gas Association, War Conference
American Institute of Chemical Engineers, regional meeting at Houston
American Institute of Mining and Metallurgical Engineers
American Petroleum Institute
American Society for Testing Materials
American Zinc Institute
The Drug, Chemical and Allied Trades Section of the New York Board of Trade.
National Association of Purchasing Agents
Technical Association of the Pulp and Paper Industry

BYPRODUCT COKE INTERESTS FORM INSTITUTE

The American Byproduct Coke Institute has been incorporated under the laws of Illinois. Leigh Willard, president, Interlake Iron Corp., Cleveland, is president of the new association. Other officers are William H. Earle, president, Philadelphia Coke Co., Philadelphia, vice president; P. H. Neal, manager, coke and byproduct sales, Alabama Byproducts Corp., Birmingham, Ala., treasurer; and Alfred Hirsh, vice president, The Laclede Gas & Light Co., St. Louis, secretary. Headquarters will be established in Washington, D. C. and Samuel Weiss, who recently resigned as chief of Fuel Section, Steel Division, War Production Board and chief of coke distribution of the Solid Fuels Administration for War, will be the executive secretary.

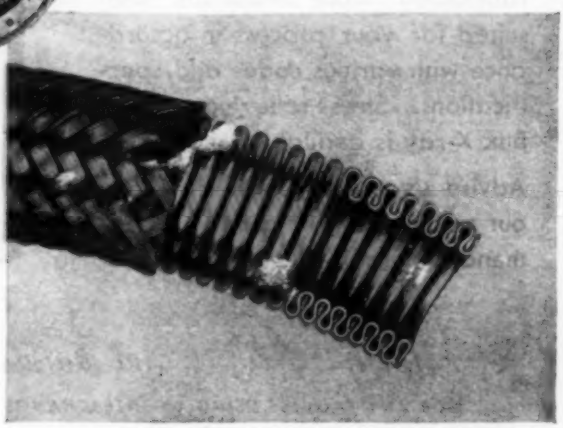
PROCTER & GAMBLE TO BUILD CHEMICAL PULP PLANT

Announcement has been made by the Procter & Gamble Co. that its subsidiary, the Buckeye Cotton Oil Co., has been requested by the War Department to build and operate a plant for the Defense Plant Corp. at Memphis, Tenn. The new plant is to produce chemical pulp from cotton linters which in turn will be shipped to plants engaged in the manufacture of smokeless powder. The plant will be wholly government-owned and will add to the chemical pulp production now being carried on at the Procter & Gamble plant in Memphis.

THOMAS AWARDED MEDAL OF INSTITUTE OF CHEMISTS

Award of the gold medal of the American Institute of Chemists to John W. Thomas, chairman of the Firestone Tire and Rubber Co., was announced early in the month by Dr. Gustav Egloff, president

AMERICAN SEAMLESS COOLS X-RAY TUBES



Note how American Seamless Flexible Metal Tubing is formed from a seamless, rustless, bronze tube. In most applications one or more bronze wire braidings are added, depending on the service for which it is designed.

ENGINEERS of the Machlett Laboratories, at Springdale, Conn., world's largest manufacturers of X-ray tubes, have found in American Seamless Flexible Metal Tubing, the solution to the problem of compact, efficient cooling for X-ray tubes.

A length of bronze American Seamless, without the customary wire braiding, is coiled around the inner surface of the cooling jacket and connected to a water inlet and outlet. The Roentgen tube is then inserted in the jacket and the ends sealed.

In operation, the tube is surrounded with oil which absorbs the heat from the tube. Cooling water, flowing through the American Seamless coil, removes the heat from the oil. As will be seen in the illustration, the flexibility of this tubing permits it to conform perfectly to the chamber wall. Its seamless construction eliminates leakage problems, while its thin-wall, bellows-like construction assures high efficiency in heat transfer, the bellows rings having the effect of cooling fins.

If you have a problem in conveying liquids, gases, steam or solids . . . isolating vibration . . . connecting moving parts or compensating for misalignment, you will be interested in the wide variety of "American" Products for these purposes. Send for a copy of Bulletin No. SS-50.

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of the Institute. The award was made in recognition of the work done by Mr. Thomas in rubber research extending over 40 years and to his contribution to the development of synthetic rubber. Formal presentation of the medal will be at Columbus on May 11.

HIGHPOLYMER RESEARCH BUREAU AT BROOKLYN POLY

In addition to the organization of a separate division of polymer chemistry under the direction of Dr. Herman F. Mark, the Polytechnic Institute of Brooklyn has established a highpolymer research bureau. President Harry S. Rogers stated that advances in the technology of plastics have been so rapid that they have outrun advances in the fundamental knowledge of polymer chemistry and the research bureau was set up to bring fundamental knowledge of the chemistry of plastics up to the present empirical knowledge of plastics technology.

PHILADELPHIA CHEMICAL CLUB HOLDS ANNUAL MEETING

The annual meeting of the Chemical Club of Philadelphia was held at Kugler's Restaurant, Philadelphia, on the evening of February 12. Committees were appointed to plan and carry out activities for the year ahead. Officers were elected as follows: W. R. E. Andrews, W. R. E. Andrews Sales Co., president; Leroy Fischer, Philadelphia Quartz Co., vice president; S. Nelson MacFaul, Merchants Chemical Co., treasurer; and G. B. Heckel, Jr., *Paint Industry Magazine*, secretary.

OUTPUT OF LITHIUM SALTS INCREASED AT TRONA

The American Potash & Chemical Corp., Trona, Calif., has been producing lithium salts from Searles Lake brine since 1938. When wartime demands for lithium increased beyond the limits of productive capacities, the corporation instituted an extensive research project and developed a new process which was tried out successfully on a pilot plant basis in 1943. This led to the establishment of a novel lithium recovery plant which went into operation last summer and current operations have quadrupled the original production.

MONSANTO MAKES TEMPORARY SHIFTS IN SALES FORCE

Pending the return to duty of Fred C. Renner who is convalescing from a serious illness, the Monsanto Chemical Co. has made Robinson Ord acting general manager of sales of the organic chemicals division. A. T. Loeffler, branch manager at New York, has been assigned to St. Louis with the temporary title of assistant general manager of sales. A. P. Kroeger, manager of intermediate sales, has been sent from St. Louis to New York where he is serving as acting assistant branch manager.

PAPER BAGS *that save* BOX CARS

PACKAGING in Multiwall Bags offers a space-saving advantage that adds up to box-car proportions.

For example, one ton of a chemical, when packed in Multiwall Bags, will only occupy the approximate space of 1600 lbs. in barrels*. Or, stated another way, *Multiwalls permit a saving of up to 20 per cent storage or shipping space over certain types of metal or wooden containers.* Figure that saving in terms of freight cars or cargo vessels and you have one important reason why many manufacturers are turning to Multiwalls as the solution to more and more of their packaging problems.

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Multiwall Paper Bags are easier to load and unload...they save costly handling time. They will be designed to withstand specific climatic and transportation conditions in all parts of the world.

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Multiwall Paper Bags will be especially made to save time and money for your business. Write for full information today.

*Report on bulk packaging prepared by Chemical and Metallurgical Engineering.

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N E W S F R O M A B R O A D

BRITISH CHEMICAL CONTROLS MAY BE TERMINATED AS SUPPLY SITUATION IS SATISFACTORY

Special Correspondence

CHEMICAL controls have played a very important part in marshalling Great Britain's chemical factories for the war effort, but recent evidence suggests that the days of their greatest power are over. There were six control offices concerned with chemical products, for sulphuric acid, fertilizers, industrial ammonia, molasses and industrial alcohol, plastics, and miscellaneous chemicals. The last mentioned of these was dissolved some time ago, and its work transferred to the headquarters of the Raw Materials Department of the Ministry of Supply which is the supervisory authority for all commodity controls in Great Britain. The other five controls may also cease to exist in the not too distant future if certain developments are any guidance. The burden of work carried by these controls has diminished; the supply position generally is less difficult, the creation of new capacity is required in few cases only at this stage of the war, and the machinery of distribution, licensing and so forth has become stereotyped. A review of staff is therefore being made at the present time, and the Select Committee of National Expenditure has advised the government that the whole organization of the chemical controls should be reviewed and consideration be given to the advantages of absorbing them into the headquarters of the Raw Materials Department.

To avoid a misunderstanding, it must be pointed out that this recommendation does not involve a judgment on the merits of control in general or of the chemical controls in particular. The British chemical controls are executive organs which carry out a policy decided upon by higher authorities. Although they perform an important advisor function in what is called the semi-technical field of trade and industry, the major decisions are taken by the Ministries. The controllers are persons selected for their personal knowledge of the trades concerned (three of them are directors of chemical firms, and the other two are officers of interested trade associations) and merely put the government's policy into practice. Nevertheless they have had to make far-reaching arrangements for the importation of supplies from abroad, provision of new capacity in the British Isles, distribution to manufacturers and consumers, rationing of materials in limited supply, directing the purposes for which the materials may be used, and fixing their prices. These ar-

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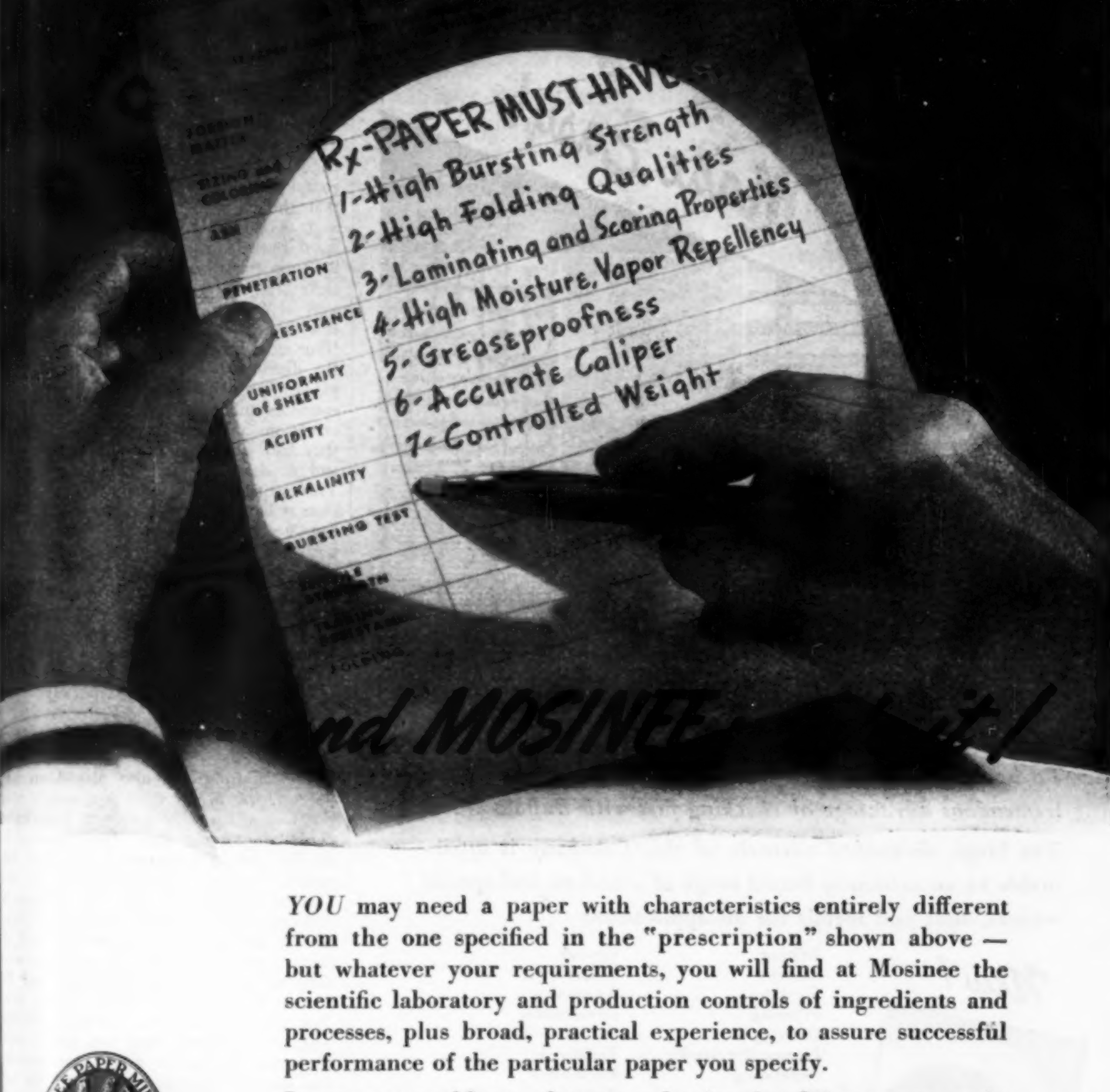

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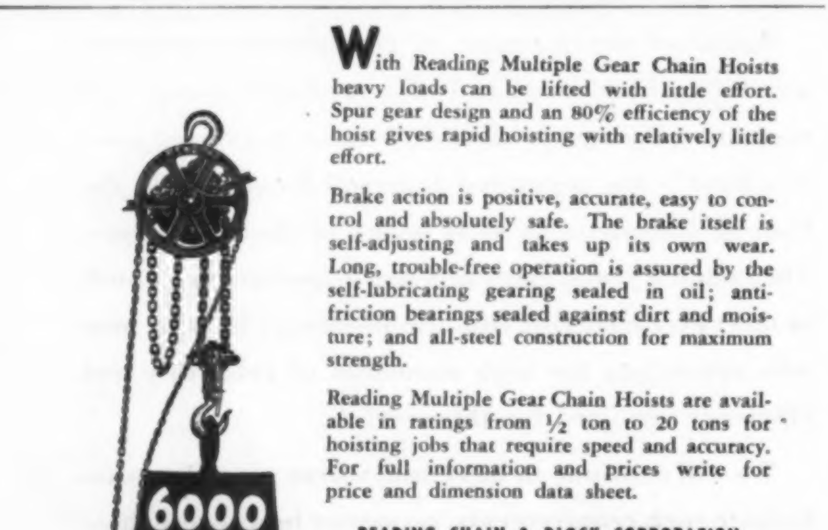
rangements, however, were completed long ago, and the present task of the controls is largely one of supervision and revision which does not require an intimate knowledge of the chemical industries and may perhaps be better performed by permanent civil service officials.

As a matter of course, the chemical controls, like other wartime expedients, have come in for a great deal of criticism if only because the very term "control" is anathema to the average British industrialist, and the controllers have often been blamed for decisions taken by higher authorities which they had to carry out. The Select Committee on National Expenditure has carefully examined these complaints and come to the conclusion that the chemical controls have worked well. As far as the use of existing capacity is concerned, it is stated that at present little of the capacity left unused at an earlier stage of the war because importation of finished materials was preferable from the point of view of shipping and labor remains unused. With regard to the distribution of new capacity to individual firms the controls have generally entrusted monopoly producers with plant extensions and new construction provided they had worked successfully in the past and possessed the necessary organization. This attitudes, the outcome of a deliberate policy on the part of the government has aroused some criticism but is supported by higher authorities on the ground that production should be entrusted to those best qualified to obtain results. If, however, the product is one which is still far from perfectly developed, it becomes a question whether it is wise to entrust its manufacture and further development to a single firm, since a different approach by another firm may yield better results.

RESEARCH CONTRACTS

The controls have also played an important part in distributing research contracts of which some hundreds have been placed during the war. The responsibility for placing extra-mural contracts for specific research objects rests with the Director-General of Scientific Research and Development at the Ministry of Supply. It was found that more than half of these contracts for chemical research have been placed with one company and its associated companies, while other producers received far fewer contracts of this type; one important firm was passed over altogether because it would not provide the necessary information about its research facilities. The Select Committee pointed out that through other government agencies the information might be obtained in such cases without any objection on the part of the firms concerned and expressed concern that considerable research facilities may have been neglected. Similarly it expressed criticism of the vacillating policy for the concentration in the paint industry where the authorities relied on a list of approved firms rather than on the normal procedure evolved by the government. Such complaints and their treatment, however, concern individual cases only and are of little importance for the future of control as a whole. It is likely that the government



will accept the Select Committee's recommendation for the transfer of the Chemical Controls' duties to the Raw Materials Department. This does not, however, mean that the future of control has as yet been settled.

SMALL FIRMS OPPOSE

Where raw materials are now in so much greater supply than before that the control system could be radically overhauled or even abandoned, the government has so far preferred relaxation to suspension. Manufacturers have been advised that such materials will be made available and can be used for purposes for which they were not supplied in the past, but even where the raw material position does not hinder an expansion of output, labor questions may make it impossible to make full use of materials. Moreover, the supply position may deteriorate for reasons which cannot be foreseen now, and if the control were to be abandoned completely, it would be impossible or at least very difficult to adjust distribution and consumption to the changed situation. It is rather interesting that the opposition against control in general and the various control authorities in particular comes mainly from smaller firms. These argue that controllers tend to work with the big firms which are best known outside their particular trade and admittedly often able to solve quantitative supply problems more easily than smaller ones, while the small firm specializing in a particular trade is deprived of the possibility to participate in technical progress and industrial advance. This objection to control is shared by bigger firms which are in the habit of going their own way and are not interested in pooling of experience and exchange of knowledge because such experience and knowledge are the fount of their own strength. As long as the problem facing the controls is purely one of increasing outputs, such objections will probably and perhaps rightly be overruled, but it is obvious that technical research and progress are not helped by over-centralization.

There is no doubt that the war has accentuated the trend towards concentration of production in the hands of a few big firms. It is also clear that this tendency will be supported by the need of mass production in certain fields, especially those connected with physical reconstruction and rebuilding. On the other hand, the British chemical industry expects that in the export trade and other directions specialization rather than concentration will be the best means of solving the problems to be anticipated after the war and many observers think that the smaller firm, difficult as its stand in the face of competition by big combines must be in any case, should not be penalized by a government policy favoring more powerful mass-production interests. Although much criticism of control is expressed in the British chemical trade as elsewhere, the continuation of some control is generally considered inevitable, but it is widely held that it should be delegated to government departments applying ordinary administrative methods and unable to make any kind of differentiation or discrimination.

DECLINE IN IMPORTS STIMULATES PRODUCTION OF CHEMICALS IN SOUTH AFRICA

Special Correspondence

EVEN DURING the war the United States has been able to supply a considerable proportion of essential chemical needs in South Africa, particularly those needed to keep the war industries going. At the same time war conditions have encouraged the development of South Africa's small prewar chemical industry, and today a large range of industrial and other chemicals is made in this country. Costs of manufacture are in some cases rather higher than in America or Britain, due to a number of factors, and unless very high protective duties are allowed or the industry is subsidized it may not be able to continue after the war.

One of the industries likely to remain after the war is the manufacture of fish and shark liver oils, which operates favorably under local conditions. The output is now on a big scale. A large quantity of the oil is being exported and supplies have been sent through the Red Cross to areas under enemy control. The South African Director of Fisheries has said that the production of these oils has proved of the greatest medical benefit in the Union of South Africa in the absence of cod-liver and similar oils which were formerly imported. He said that a fair amount of oil was being extracted from the gray shark, which is common in South African waters. During the war years the production of liver oils from sharks has also received a big impetus in the United States, he said. There fish oils had been produced for many years before it was discovered that sharks yield a more potent oil.

South Africa now has several factories manufacturing sodium silicate, for the production of which local raw materials are used. Before the war South Africa imported annually over 4,000,000 lb. of silicate, but now hopes to produce the entire needs in local factories. So far it has not been possible for South African factories to export much of this chemical to neighboring territories, but in East Africa large quanities of Indian sodium silicate are being used in soap. Previously the bulk of such products was obtained from America and Britain, although before Pearl Harbor Japanese silicate also was sold in East Africa. South African manufacturers seem to be planning to trade in these lines in the various African countries after the war. A Johannesburg factory now has an output of about 100 tons of sodium sulphate a month and further increases are planned.

The Fuel Research Institute reports that a highly active carbon—charcoal from wattle wood—has been found suitable for use in the oil regeneration process and generally as a decolorizing agent. Drawings of a portion of the pilot plant used in the preparation of this carbon have been prepared and with them a layout plan of the

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3. **Wetting and Dispersion of Liquid-Solid Systems.**
4. **Inhibition of Rust and Corrosion.**

Petronate has won wide acceptance as an important basic material for many industrial adaptations. It lends itself to a great variety of uses, among which are the accompanying examples of its functions as a rust and corrosion inhibitor. Typical functions of Petronate in the other logical fields listed above were covered in earlier issues of this series (*reprints on request*).

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Sulfonates	62%
Mineral Oil	35%
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★ EXAMPLES ★

USE	PRIMARY FUNCTION OF PETRONATE	SECONDARY FUNCTION
Preservative Lubricating Oils	Rust and Corrosion Inhibiting Agent	Acts as Moisture Absorbent
Additives for Lubricating Oils	Acts as Detergent	Inhibits Bearing Corrosion
*Extreme Pressure Lubricants	Stabilizing Medium for Extreme Pressure Agent	Prevents Corrosion
Soluble Cutting Oils	Emulsifying Agent for Mineral Oil	Rust Inhibitor
Rust Preventive Compounds	Rust and Corrosion Inhibiting Agent	Acts as Moisture Absorbent
Automobile Radiator Coolants	Inhibits Internal Rust and Corrosion	Aids in Dispersion of Scale
*Steel Pickling	Acts as Passivating Agent Against Pickling Acid	Aids in Dispersing Scale and Rust

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NOTE.—By reason of its present use in the manufacture of war-important products, PETRONATE is available only on allocation. However, ample postwar supplies are anticipated.

WHITE OIL DIVISION

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plant and a description of the manufacturing processes. It is urgently necessary for South Africa to do everything possible to conserve its stocks of lubricating oil and to reduce in every way possible the importation of new stocks. Some time ago plant for regenerating used lubricating oil was designed by the Institute. It was fairly simple and could handle about 80 gallons of oil a day, but the difficulty was that bentonite had to be used to remove impurities and decolorize the oil. It was almost impossible to import this material and as no satisfactory substitute could be found little use was made of the plant, which can now be used with the active carbon. It is possible to regenerate used lubricating oil several times, and each time only a small percentage of the oil is lost. So far only the government departments have used the plant.

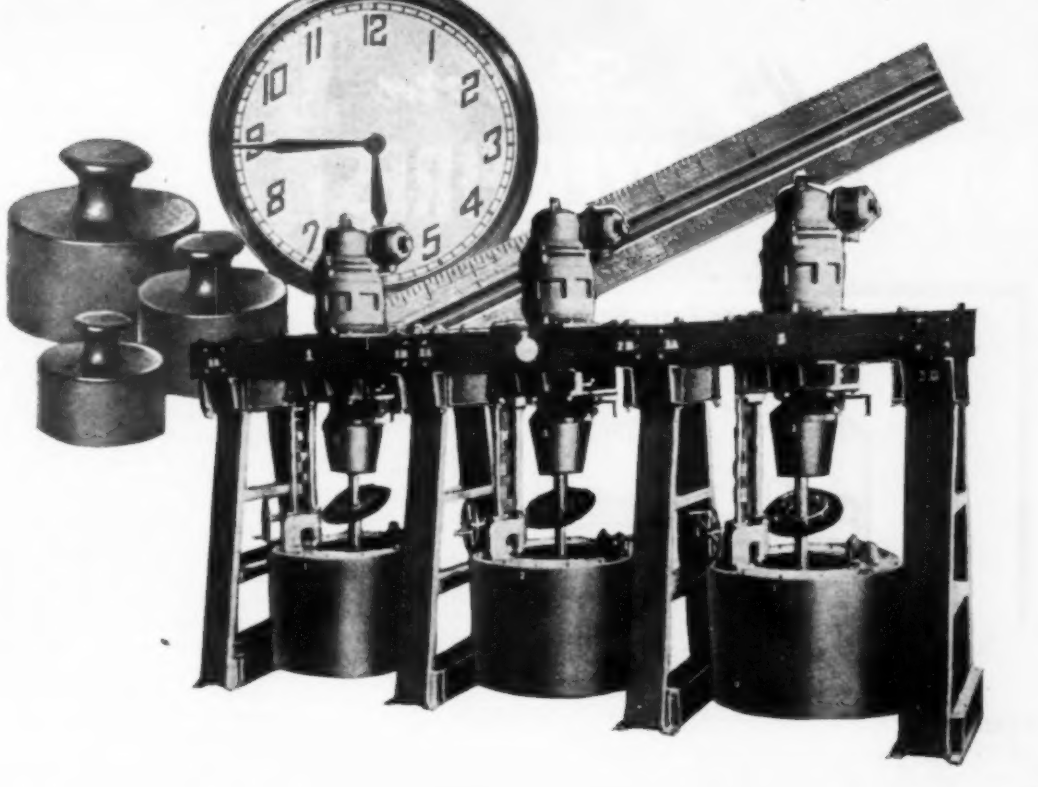
During the war years there has been a heavy increase in the South African consumption of cyanide, particularly in gold mines, which annually require several thousand tons. Only small quantities of such chemicals are now being imported, which means that the local industry is striving to serve total needs. The basic raw material, ammonia, is being taken from the atmosphere and the sodium needed is obtained from common salt of South African origin.

There has been a severe rationing of gasoline in South Africa for two or three years, but so far little interest has been shown in the patent fuels obtained by diluting gasoline with power alcohol, of which over 3,000,000 gallons can be produced annually from maize and sugar cane. Actually the quantity of power alcohol that could be produced is unlimited, provided the necessary plants could be obtained. Natal experts have investigated the economic possibilities of power alcohol production direct from the cane, which is a different matter from the existing method of producing it from molasses. So far the government has not offered assistance, but if it did there are other valuable wartime supplies, like cellulose and glycerine, that could be made from the cane.

NEW CHEMICALS

Some Johannesburg firms are developing the manufacture of essential industrial chemicals, among which the newest products are potassium bichromate for the match industry, sodium nitrate for producing fertilizers, white lead in powder form for the paint industry, and chromic acid for the electroplating industry. Other chemical concerns are making heat-reactive glues specially prepared for plywood bonding, cardboard spiral winding, laminated wood products and other uses where a strong bond is needed and heat can be applied. They are also manufacturing turkey red oil and water-soluble oils, all lines previously imported.

In Johannesburg factories are producing a large range of paints, including oil liquid paints, industrial finishes, enamels, lacquers, primers and driers, and varnishes, including spirits and insulating varnishes. This is helping to compensate for the serious lack of many types of paints. Some firms often have a pigment department in which is made a large selection of colors, including chrome red and emerald green.



MINUTES, POUNDS, FEET RECOVERED

EXTRACTION: AT&M Centrifugals Cut Drying Time 50%. Manufacturer A, already using a centrifugal, agreed to test a faster centrifugal, although doubtful it would solve his production problem. By increasing RPM's from 850 to 1150, thereby doubling centrifugal force, drying time was cut in half. A minute saved from each cycle made an extra load an hour possible.

For nearly a century, AT&M has specialized in manufacturing for extraction, filtration, dehydration, precipitation, impregnation, and coating. Through the use of centrifugal force far greater than gravity, AT&M engineers have helped many manufacturers to increase their production over that achieved by slower centrifugals or other unwieldy, space-consuming methods.

CLARIFICATION: AT&M Centrifugals Save Expense of Filter Cloths. Manufacturer B was using an acid so strong that filter cloths were quickly eaten away and losses ran from 25% to 40%. By substituting an AT&M centrifugal with rubber-covered imperforate basket and spindle, plus a lead-lined curb, he not only solved his filter replacement problem but also cut loading time from 7 minutes to 40 seconds and recovered 95% of a scarce chemical.

AT&M engineers have often adapted centrifugal force to difficult jobs—designing special frames, combining operations in special baskets, often eliminating troublesome operations entirely. Most cases involving lowered costs and increased production, however, have resulted from the purchase of standard AT&M machines.

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capable engineering service (as war needs permit)—no charge for study and recommendation. Centrifugals and baskets in all machinable metals and coatings. Strict confidence preserved. AMERICAN TOOL & MACHINE COMPANY, 1415 Hyde Park Ave., Boston 36, Mass., 30A Church Street, New York, N. Y.

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CENTRIFUGING

During the last two years or so there has been a steady increase in the importation of phosphates from Morocco for the manufacture of superphosphate. In spite of this increased production there is still a serious shortage of fertilizers, and likely to be until the war ends. It was stated recently that many of the large Transvaal citrus orchards are no longer being maintained at their prewar condition, as most of the trees were now showing in varying degrees the symptoms of nitrogen starvation. This has been brought about chiefly by the shortage of fertilizer supplies. In an attempt to increase general fertilizer supplies some of the South African phosphate deposits are being worked, even though these are not of high grade. Phosphates from the deposit at Langebaan, 45 miles from Cape Town, have been opened up. The refining is being done by the newest methods, but the resultant product will only be economically possible while prices are higher and imports on a low level.

Scrap tobacco may be used to produce tobacco extract for industrial use as a substitute for chemicals now difficult to import. Normally it is difficult to treat and market the product. Officially the idea is not receiving much encouragement, as it is insisted that there is not enough waste tobacco of sufficiently high nicotine content for the industry.

Durban chemical manufacturers have begun the production of refined wax for pharmaceutical and cosmetic manufacturers and they are also producing essential oils and heavy chemicals like washing soda, caustic soda and soda ash. These firms also usually produce insecticides, insect powder, disinfectants and a number of industrial chemicals.

Although some South African chemical industries are undoubtedly of a lower level of efficiency than many of their overseas competitors, this cannot be said of the industry which is supplying other South African concerns with glucose, starch and dextrine. A Germiston factory recently spent about $400,000 on new buildings and plant to enable it to cope with the increasing demand for such products. In spite of a big increase in the cost of maize and the increased cost of engineering supplies and labor, the cost of many of the products to the consumer is now on about the same price level as before the war.

NEW GLUES

Two new glues have been developed in South Africa. One is a "60 minute" powdered glue of interest to furniture manufacturers. In the past pressing flat or bent members required from 3 to 6 hours, but with this glue it can be done in an hour in the case of cold pressing and in two to four minutes when hot pressing is available. The other line is a liquid glue with high initial tackiness and strong bonding power. It is ready for use, obviating soaking and heating. At the moment it is packed in bulk, but it is hoped later to market it in retail packings.

Although the chemical industries, not only in South Africa, but also in Southern Rhodesia and the Belgian Congo, have been extended in many directions since the outbreak of war, there are still many types of industrial and other chemicals that are

The YORK Allis-Chalmers Turbo REFRIGERATION Compressor

BALANCE DISC equalizes unbalanced shaft thrust caused by unequal gas pressures on opposite faces of each wheel caused by lower pressure at wheel inlet area. The region behind the balance disc is connected by a passage to the inlet and, therefore, is subject to suction pressure. The opposite face is subject to discharge pressure. The York balance disc eliminates the need for heavy duty thrust bearing with attendant higher friction losses.

York Corporation, York, Pennsylvania.

Other Outstanding features

1. Low center of gravity of compressor—permitted by trough type cooler—cuts vibration, provides more accessible operation.
2. Stainless steel impeller blades resist erosion and corrosion assuring perfect wheel balance. Blade rivet heads are eliminated to provide unobstructed gas flow.
3. Pre-rotation vanes permit greater capacity reduction (down to 10%.)
4. Permanently silver-sealed condenser joints.
5. Simplified refrigerant shaft seal.

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YORK REFRIGERATION AND AIR CONDITIONING

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

beyond their scope. War conditions have made it difficult to import any but most essential needs from the usual sources, consequently the Argentine and Brazil have broken into the South African market as suppliers of such chemicals.

Tinning and soldering fluxes and other such engineering requirements have been made in Natal for several years and since the war the industry has maintained an expanding output of the important fluxes. Among the fluxes that have been in large use is a tinning compound for preparing the face of bearing castings with a surface of pure tin prior to pouring in of the white metal. This product is stated to have given general satisfaction and has been used in repair operations on ships in South African ports.

During the war large quantities of chemicals have been lost by enemy action on the way to South Africa. Many of these chemicals have to be imported, as substitutes cannot be provided from local resources. The improved shipping position has lead to a better supply of these chemicals in recent months, but the government is still allowing a high priority only on those essential to local industry and for which substitutes cannot be found in the country.

NEW SUPERPHOSPHATE PLANT PLANNED FOR SPAIN

Application has been made by Sociedad Anonima CROS for the establishment of a superphosphate plant in the Province of Tarragona, Spain. Annual production is expected to reach 20,000 metric tons. About 11,000 tons of calcium phosphate will be imported yearly. This company, capitalized at 200,000,000 pesetas, is the largest Spanish producer and distributor of superphosphate and has 13 plants in operation. Total capacity of these plants is estimated at 1,000,000 tons a year. There are 17 superphosphate-producing companies in Spain with an annual capacity of 1,750,000 tons but actual output is limited because of the scarcity of raw material.

CUBA EXPERIMENTS WITH SULPHUR DUSTING

Experiments with sulphur dusting for the control of peanut leaf spot were conducted successfully in Santa Clara Province in central Cuba during the 1944 season. The yield of peanuts increased markedly—34 percent for the Spanish type and 49 percent for the Chino type. For the first dusting, the rate of application was 12 lb. of sulphur per acre and for the second and third dustings, 19 lb. each were used making a total of 50 lb. per acre for the complete treatment.

CANADA HAS FLAX PLANT UNDER CONSTRUCTION

The fiber-flax pilot plant erected by the Canadian Government at Portage la Prarie, Manitoba, is expected to be completed this winter. In addition to 100 acres of fiber flax about 100 acres of linseed flax will be processed to determine the fiber possibilities. All flax was harvested with a pulling machine and is be-

ing subjected to both tank and dew retting. Indications are that tank retting will be the more feasible method for producing commercial fiber.

BOLIVIAN PLANT TO REFINE VEGETABLE OILS

The Department of Commerce reports that a Bolivian firm recently purchased and installed seed pressing and oil refining equipment in its plant at La Paz at a cost of about 7,000,000 bolivianos. The name of the company was not given. The report says the plant will utilize imported linseed and sunflower seed. Efforts also are being made to stimulate home production of oilseeds. Approximately 600 tons of sunflower seed were on hand at the time the report was made. The capacity of the plant is estimated at 100 metric tons of refined oil monthly which is considerably above current consumption requirements in that vicinity.

FRENCH MOROCCO CONSIDERS DRY ICE MANUFACTURE

Studies made by the Moroccan Chamber of Commerce and Industry with a view toward the development of postwar industries point to the probability that French Morocco will undertake the manufacture of dry ice when conditions become more favorable. The report states that carbonic acid is one of the country's natural resources, found in large quantities in the Oulmes region.

EIRE RESEARCH DIRECTED TO DEVELOPMENT OF SOLVENTS

Attention of the Eire Emergency Research Bureau has recently been centered on the field of organic solvents. Research has been especially directed toward possible methods for improving acetone production and the development of processes for the manufacture of butyl and amyl acetates. Fears also have been voiced regarding a probable shortage of sodium hypochlorite solutions for use in creameries and other lines and it is suggested that domestic production of this chemical be established.

NEW SITE FOR CHLORATE PLANT IN ARGENTINA

Production of potassium chlorate in the Argentine has been carried out in an electrolytic plant in the Buenos Aires area. Plans have now been made to transfer production to Rio Negro where nearly 5,000 acres have been purchased near Cinco Saltos Falls. A project involving an expenditure of from 20,000,000 to 30,000,000 pesos is under consideration with production of potassium chlorate to be supplemented by the manufacture of calcium carbide and insecticides.

SWEDEN HAS NEW PLANT FOR ETHYL CELLULOSE

Manufacture of ethyl cellulose has been established at a new plant at Skoghall, near Karlstad, Sweden. Uddeholms A/B is the owner of the plant and its output is intended principally for the cable industry where the chemical is used as an insulating material.

CORROSION FORUM

EDMOND C. FETTER, Assistant Editor

NEWS BRIEFS

Among the organizations formed for the purpose of studying corrosion is the National Association of Corrosion Engineers, Drawer 2220, Houston 1, Texas. NACE was organized in 1944 around a nucleus of engineers from the petroleum industry. Many of the newer members represent other industries, however, and it is believed that membership will soon represent the various industries in proportion to their size and the seriousness of their corrosion problems. Membership, standing now at 350, is open to all individuals actively engaged in corrosion work.. A quarterly journal called *Corrosion* is scheduled to make its first appearance in March as the association's official publication. It will carry NACE convention papers together with news and other items.

ASTM spring meeting postponed:—Due to travel restrictions, the meeting on corrosion prevention scheduled for Feb. 28 in Pittsburgh has been put off indefinitely.

Pipe corrosion in the oil industry:—The Battelle Institute has recently begun a study of the corrosion problems involved in the pipes and fittings of high pressure condensate wells. Initiated by the Natural Gasoline Association of America, the program calls for an annual expenditure of $20,000 which is to be raised by subscription among producing companies in the Southwest.

CORROSION REPORTER

Chemical processors have long used rubber and rubber-lined equipment to handle certain corrosives. Recently the question has arisen: Can synthetic rubber duplicate natural rubber in point of corrosion resistance, and if so, which type of synthetic rubber is best suited for any given application? To get the answer we consulted the director of research and product design at one of the large rubber manufacturing companies. His comments follow:

"Almost every consumer would like to have the rubber manufacturer tell him exactly which of the several synthetic rubbers is best suited for his particular use and to predict for him quite exactly the life that can be expected from the rubber-covered tanks that he uses in his various processes. Unfortunately the rubber industry is not in a position to be so definite in its recommendations.

"It must be remembered that the only types of synthetic rubbers that were produced in large quantities prior to 1943 were of the oil- and solvent-resistant types. They were intended to supplement rather than replace natural crude rubber. The types of synthetic rubbers which were developed and produced since 1943 and which, incidentally, are by far the largest quantities of synthetic rubber produced, are designed primarily to replace natural crude rubber, not to supplement it. They are not oil and solvent resistant but more nearly resemble natural crude rubber.

"Since these latter synthetics have only been in production and use for a very short time and since the chief effort of necessity has been to produce the largest quantity possible in the shortest time, only a limited amount of effort could be expended in exploring all the potentialities these various types may possess. It can therefore be readily understood that it is now quite premature (and may be definitely misleading) to attempt to predict just which types of synthetic rubber will be best suited for a given purpose. Likewise it is not possible for a manufacturer to prophesy just how many years of useful life can be expected of his products.

"It can be said that all accelerated life tests on a wide variety of products indicate first, that no one synthetic rubber can be expected to replace natural crude rubber in all its many uses but second, that with proper selection from the various types of synthetic rubber in their present state of development, products can be made which equal, and in some cases even surpass, the products that were made from natural crude rubber.

"The chemists and engineers who developed, designed, and put into operation all within two years this giant synthetic rubber industry are now busily engaged in its refinement. Therefore, the future of synthetic rubber products will be one of rapid improvement. To the consumer this means that each problem, as it comes up, should be studied individually by a competent rubber manufacturer in the light of the latest developments, and in no case should broad, generalized recommendations be allowed to become the basis for selecting or rejecting a particular type for a particular job. Having observed these precautions, the consumer can be reasonably sure of getting a product capable of replacing worn-out natural rubber in any kind of equipment."

LITERATURE REVIEW

J. Frederic Walker, "Formaldehyde," p. 44-45, Reinhold Publishing Corp., 1944:—Recommended materials for formaldehyde storage are glass, stoneware, acid-resistant enamel, 18-8 stainless steel, rubber, and aluminum. When aluminum is first exposed to formaldehyde solutions some corrosion takes place, but the metal is soon covered with a resistant film of corrosion products. Formaldehyde causes a slight degree of corrosion and is discolored by a number of metals—in particular iron, copper, nickel, and zinc alloys. Coating materials such as certain asphalt-base paints, phenol-formaldehyde resin varnishes, or rubber preparations produce fairly resistant storage vessels. Reinforced concrete tanks lined with asphalt and acid-resistant brick are highly satisfactory for bulk storage. Concrete coated with molten paraffin is, after thorough drying, also satisfactory and will last without relining for a considerable time. Wood shrinks on exposure to formaldehyde and for this reason is not entirely suitable for bulk storage, although properly constructed barrels are used. Solutions in contact with wood may extract a small amount of resinous material and thus become discolored. If the solution is also in contact with iron or copper, deep discolorations ranging from blue to black may result. However, this does not impair solution strength nor render it unsuitable for many ordinary uses.

K. H. Logan and M. Romanoff, "Soil corrosion studies, 1941," *Journal of Research* National Bureau of Standards, Sept. 1944, p. 145-198, 21 references:—Reports the conditions of a large variety of ferrous and nonferrous materials and a considerable number of metallic and organic coatings after 2 to 9 yr. burial under simulated practical conditions in 14 different corrosive soils. Results indicate that alloying elements in small percentages have no marked effect on corrosion rate of ferrous alloys, but large percentages are apt to improve corrosion resistance considerably. Steels high in Ni and Cr, and copper alloys high in Cu are very resistant to nearly all soil conditions. Lead corrodes only slightly when a coating of insoluble Pb salt is deposited on the lead. Asbestos-cement pipe gained somewhat in bursting and crushing strength after 4-yr. exposure. Zinc coatings (3 oz. per sq.ft.) add about 3 yr. to the life of steel, but lead coatings appear to be inadequate for severe conditions. A coating of tin over copper gave little protection over a 4-yr. period. Several experimental coatings—vitreous enamel, two thick rubber coatings, a thick molded coating of chinawood and mica, and a thin backed-on Bakelite coating—greatly reduced corrosion over periods of 4 to 9 yr. Thin coatings, of which there were several, reduced corrosion but showed distinct signs of deterioration.

P. S. Barnes and S. C. Orr, "How to extend the life of glass-lined steel equipment," *The Glass Lining*, a quarterly publication of the Pfaudler Co., winter 1944:—Glass-lined steel equipment is available in qualities resistant to all mineral and organic acids at all concentrations and

high temperatures, except of course HF and possibly hot concentrated phosphoric. But even in these applications where glass is applicable, it is extremely important that the initial working range and specifications be adhered to, since all of the several types of glass offered by each manufacturer are by no means equally resistant. In selecting cleansers and sterilizers it should be remembered that glass is vulnerable to caustic alkalis at even low concentrations and to mere traces of the fluorides. Solids adhering to glass enamel should be removed with a non-alkaline solvent if possible, otherwise with a wooden or soft-rubber-tipped shovel or spatula.

Observance of a few reasonable, but frequently ignored, precautions can do much to lengthen the life of glass-lined equipment. (1) Don't subject it to thermal shock in excess of about 175 deg. F. (2) Take care that steam injected into the product does not impinge directly against the glass and cause errosion. (3) Don't heat by direct flame lest localized overheating cause fracture. (4) Inspect gaskets regularly to avoid seepage and corrosion of the unprotected outer faces of the flanges. (5) Replace leaky gaskets; merely tightening the clamps or bolts invites fracture of glass enamel. (6) Check agitator stuffing box packing regularly and replace it before it becomes sufficiently hardened to score any enameled surface on which it may bear. (7) Don't exceed the manufacturer's rating for jacket or internal pressure and check periodically the proper functioning of any devices used to regulate or indicate pressures.

In assembling clamped or bolted-on covers and in bolting valve fittings or pipe lines to flanged openings, allowance must be made for a certain amount of warpage of the base metal, caused by the high temperature of the glass-fusion process. All such joints must always be gasketed, and where warpage is such that a joint cannot readily be made tight, the gasket should be built up with asbestos rope or shims at the necessary spots.

Regular routine inspection of the glass lining itself is of the utmost importance, since early discovery of incipient or actual failure before extensive corrosion has occurred permits field repairs or reconditioning by the original manufacturer. Field repairs—where the area of exposed base metal is no more than ½ in. in diameter—are best accomplished by drilling into (but not through) the base metal, undercutting, and tamping solidly with pure spongy gold, using exactly the same tools and technique as a dentist uses to fill a tooth. Other materials and techniques are applicable where conditions demand them—as where larger areas are exposed or where the solutions to be processed will attack gold. Although such repairs may require occasional renewal, experience proves that they will in no way shorten the service life of the unit provided they are properly made, periodically inspected, and renewed when necessary. Equipment which is too damaged to be repaired in the field can often be reprocessed by its original manufacturer, and many years of utility can be restored by welding up holes, replacing corroded flanges, welding in patches where necessary, and by replacing the lining.

FROM THE LOG OF EXPERIENCE

DAN GUTLEBEN, Engineer

Dale S. ("Dave") Davis returns to the Log this month with another group of pulp and paper stories like the ones which made such a hit last November. In passing them along, we renew our offer to swap some of our War Bond money for a few "tricks of the trade" brought forth from your own Log of Experience.—*Dan Gutleben*

CARS AND WOMEN were the only two topics of conversation among the boys at the Bureau of Tests—and in the long Adirondack winters few could use their cars. From Christmas until Easter the narrow, snow-choked roads kept New England cars from reaching Glens Falls, but when the first Massachusetts license plates were spotted late in March we knew that the Mohawk Trail was open once more and it was time to see what Sid Dull had to say about Sears tires and Montgomery-Ward batteries.

Sid was the expert tester of our own and competitors' paper, and he was also our veteran motorist. He had owned a car longer than anyone else and no one thought of buying any sort of accessory without first consulting the oracle. Car discussions usually started with someone's quoting Mac Vine, the chief chemist, who had once said that his Oldsmobile, being six years old, would soon be mellow enough for him to really enjoy it. Sid himself favored the Dodge, averring that he "had not paid a cent in three years for repairs" on his own. To which Phil Kuss, the janitor of German extraction, reparteed, "Sid, vy don't you pay your bill?"

GOOD OLD "JIGGS" DONAHUE, mild-mannered Irish bantam, veteran of World War I, took to chemistry with unusual grace. His prized possession was an operating acquaintance with logarithms. He conducted his analyses faultlessly by rote, specializing in alums, rosin size, cement and the complex tanning extracts from waste sulphite liquor. Jiggs' boot training included carrying the day's mail to the post office at five o'clock. As he progressed in chemical proficiency he relinquished this job to Henry, the new laboratory boy. On a sizzling July day Jiggs impressed Henry with the new responsibility, adjusted the bag to his shoulders, and walked with him up Glen Street Hill. Henry trudged along without enthusiasm. At the top of the hill Jiggs gave Henry some final instructions, removed two large Stillson wrenches from the knapsack and then proceeded homeward to administer a domestic job. In time Henry developed into an expert technician, especially in colors, but he still suffers a painful complex whenever he sees a pack mule.

Jiggs possessed in outstanding degree the quality of neatness both as to his work and his personal appearance. He kept his shoes polished by the use of Mac's hat brush. Around the lab he was usually quiet but, like every contented workman, he had a song in his heart, which might burst out without notice. His song was Pestalova's "Cirbiribin" which he stubbornly rendered as "Chilly Belly Bay." He argued vigorously against the installation of a 12-in. desk fan in the vent duct of the laboratory hood on the grounds that "It'll blow, but it won't suck." This epigram still floats around the laboratory. The fan performs with perfection even though Jiggs would never believe it. To him it was easier to change the facts than his formula. He repeatedly averred, "You can't fool a detective." The boys permutted this pronouncement into, "You can't fool a defective" and "You can't detect a foolative," greatly to the merriment of the laboratory staff.

During the great era of prohibition alcoholic contrabrand moved from the legal distilleries north of the border to the metropolis in the South, and diversions were made at way stations like Glens Falls. The circumstance of its prohibition attracted Jiggs. Hitherto chewing tobacco had provided contentedness (cf. the "Carnation Cows"). Now he was gradually swinging to liquor. The usual telltales—red eyes and supercheerfulness—indicated that the habit was growing but discretion was demanded in view of the prejudice of rabid-teetotaler Rose, Bureau Director, as well as the gumshoeing of chief chemist Mac Vine. The confederates aided and abetted Jiggs by means of special signals. When Jiggs was suspiciously out of the laboratory, the underground would deliver to him a signal with the hand held high, meaning "cheese it, the big guy," or with hand held low, meaning "look out, Mac's trailing you." For years Jiggs eluded the tall Mr. Rose and the short Mr. Vine by means of the "high sign" and the "low sign."

The board of directors held their annual meeting at near-by Palmer Falls, near enough to serve as a warning to get the laboratory tidied up for a possible visit. For twenty years this annual threat failed to materialize but in '29 everyone including even Rose was surprised! Jiggs had fortified himself generously with new stock and, just as he was passing through the cement-testing laboratory on a furtive mission towards the alley, he was met head on by Boss Rose and a delegation of brass hats. The stimulating effect overcame his usual shyness and he regaled the visitors with a terse and perspicuous dissertation on the performance of the Olsen testing machine. Rose later reported to Mac that "Jiggs was in excellent spirits." It was apparent to everyone else that the excellent spirits were in Jiggs.

HANS VAN DOORN, a highly moral young Dutchman, endured our group of sinners only a few months. He had acquired the use of English to a fair degree but, in matters of dress, he still wore the little Dutch hat and the short, cuffless, European-cut trousers with the high waist line. The boys dubbed him "arm-holes-in-the-pants-pockets." As a boy scout in Holland he had acquired the habit of walking and he practiced it now on the long and lonely Lake George road for reasons of health. In the lab he was the great fresh-air fiend to the consternation of his fellows. The boys found it necessary to nail down the sash as this was the language he best understood. He applied himself laboriously to the determination of the silver number of sulphite pulp, though this seemed without purpose since the establishment of the copper number was completely satisfactory. On an occasion Mac handed him the distasteful job of testing some unpedigreed hootch intended for the mill manager's Christmas party. His fractionation of the liquor was accompanied by dark Dutch oaths. His job completed, he by-passed Mac and sent his report directly to the mill manager. Hans reported "12.5 percent ethanol. Unfit for human consumption." The manager was about to discharge his jug into the garbage can when Mac chanced to hear about it and clarified the meaning of the chemical terminology.

ELWOOD DE SOTA, our own faithful "Doc," at 65 turned over his medical practice to his son and retired with his apple-cheeked wife to a cottage in the Glens Falls suburb. He had planned to indulge his love of flowers. However after Pearl Harbor the Army took three of our village physicians including our mill doctor. Dr. De Sota forthwith scrapped his long-cherished plan and proceeded to dispense good cheer and medical service among the paper mill employees. Wherever he went gloom vanished. He well understood the therapeutic effect of mirth and he enjoyed its practice. He spent long hours wandering through the mill cultivating friendliness with the men, suggesting the removal of safety hazards here and there and instituting preventive medicine especially in the way of voluntary annual physical examinations. When the mill nurse left for the front, Mrs. De Sota took her place.

Doc also practiced mirth at home. Mrs.

De Sota had laid on her desk an informal invitation from the Women's Civic Club to a tea and musical designed to raise money for the U.S.O. The date was two weeks off. When she looked at it again on the morning of the tea she was puzzled by the abbreviation B.Y.O.S. at the bottom. Elwood suggested that it might mean "Busy Years for Old Surgeons." This did not make sense to her and so he supplied another guess, "Bring Your Own Sugar." In the evening he inquired how she had fared. She had fared very well and was the only guest bearing sugar, and she added "don't let me catch you in my mail again." He rejoined, "You didn't catch me that time."

The Doctor had a varied collection of phonograph records including swings and operatic and symphonic numbers. He had a desire to add a tuneful ditty called "Five O'Clock Whistle." While he was at the department store it occurred to him also to order an army cot. The saleslady at the music counter regretted that she was just out of "Five O'Clock Whistle," but expected some soon. "Is there anything else?" "How about an army cot?" the Doc asked. "An Army Cot," meditated the girl. "That must be one of those new records. We haven't that one either but we can get it." So the Doc chuckled, left his order and his 'phone number and then sought out the furniture department.

Making investigations into popular myths was one of the Doctor's delights. He proved that the traffic lights which were colloquially called "stop lights" should in fact be called "go lights." During a month's record he had found that 75 percent of the traffic controls that he had met were green. When a passenger train blocked his path he improved his time by pacing the platform and collecting the autographs of the porters. Contrary to popular belief he found only one George in 40 and this subject's name was George Washington George. He investigated the assertion that almost no one has a clear title to the umbrella he carries. To test this proposition he dashed out onto the sidewalk one rainy day and demanded of a meek looking Mr. Milquetoast who adventitiously came by, "Where do you think you're going with that umbrella?" The answer shot out, "Home. I just bought this umbrella. Want to see the sales slip?" The boys manufactured a sequel to this one. At Christmas, they said, Doc bought four umbrellas and was carrying them home on the bus. There he ran smack dab into stranger Milquetoast who remarked gently, "I see you had a good day!"

A pedigreed pooch came to the Doctor from a friend in the West, express prepaid. While waiting for the arrival of the birth certificate, Doc addressed the pooch informally as "Hey You." When the papers caught up with him, the pooch was shown to be the son of a long line of blue bloods, but no name was mentioned. However by that time the puppy answered obediently to "Hey You" and this name was entered into the record. The Doctor had to use circumspection when he called lest some passerby might interpret his call as a personal challenge.

The Doctor even injected mirth into

his daily good deed. Candance Carlton had lost her fiance in the battle of Bataan and the Doctor helped to dispel her grief with "flowers." Dandelions from his lawn were presented as "dwarf chrysanthemums." Sunflowers became "solar daisies" and the weeds along the railroad tracks were resplendent as "junior jonquils." With this build-up Candance wasn't a bit surprised when he brought her an innocent-looking bulb with complete instructions for growing it in a beaker. After a time Candance confided to the Doctor that the bulb exhibited little vitality but smelled strongly of onion. Doc thereupon pointed to the label "Narcissus lachrymosa."

Doc halted his automobile one day where a crowd was waiting for the bus. He signalled to Joe Norman, the sulphite superintendent, to get into his car. Joe was followed into the back seat by a stranger who had mistaken Doc's nod to refer to him.

The stranger initiated the conversation by remarking, "It was a great gang wasn't it."

Doc had no idea to whom the man referred, but he admitted that it was indeed a great gang, and countered, "Do you see those fellows anymore?"

"Oh yes, every day," said the stranger.

"How about good old Bill?" Doc asked, remembering Stephen Leacock's sparkling story of a similar experience with a stranger on a train. "Do you ever see him?" This was perfectly safe. There's a Bill in every crowd, Leacock had said.

"Bill? Bill who?"

("I've gone too far," thought Doc. "Is it possible the man doesn't know a Bill?") But this was no time to falter so he plunged on, "Why Bill—ah—oh, I forget his last name but you know him all right."

"Oh, you mean *Bill!*" he exclaimed, heartily. "Sure, I see him every once in awhile."

They were in front of the mill then and when Mr. Norman had left, Doc said, "Great guy, Joe Norman."

"Yes, isn't he?" the stranger agreed. "He's always just the same."

At the tracks Doc turned left and the stranger got out. Reaching the clinic, Doc called Joe at once, "Say, who was that bird, anyway?"

"I don't know, Doc. I never saw him before."

"Why, the big bluffer!" he exclaimed.

"I think there were two of them," replied Joe.

BUZZ BOMBS are nothing new. The first flying bomb attack in history was recorded at 9:15 on the morning of Friday, Aug. 26, 1926. The locale: Caldwell Street, Chillicothe, U.S.A. That day, almost 18 years ago, was a scorcher in Chillicothe, but Caldwell Street itself was heavily shaded and still cool. Far down the street the super calenders in the paper mill were humming steadily; a rain crow mourned from an ancient elm; and the air was sweet with the scent of rambler roses.

A postman was delivering mail to the stately old houses. Doc Davison, a white chow, was interring a juicy bone in a

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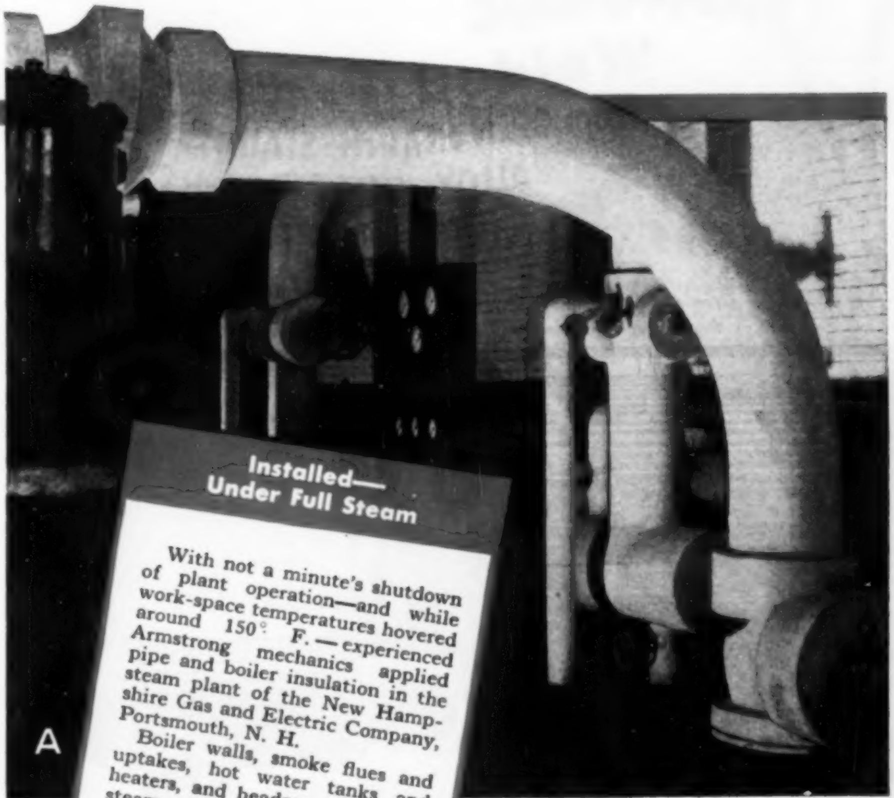

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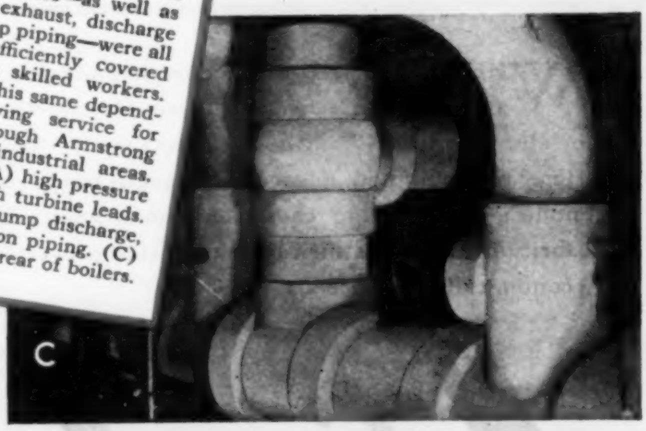

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neighbor's flower bed and Albert Steele was enjoying an after-breakfast cigar on his front porch. It was a moment of singular peace but it was not to last for long.

There was a shrill, whirring noise, followed by a splintering smash. Mr. Steele dropped his cigar, dashed indoors and reported to the police that an airplane had crashed on Dr. Mills' house across the way. Caldwell Street came alive at once. Windows went up, neighbors rushed outdoors, and a crowd collected. The police arrived and could find no sign of a plane on the roof or in any of the large trees. Sure, then, that a meteor had fallen someone called the fire department. In a few minutes a ladder was put up and one of the firemen reported a 3-ft. gash in the roof.

Dr. Mills and his family were away on vacation. Entering the house with a key, a neighbor found a large rectangular piece of steel on the living room rug. Dust still floated in the air, broken plaster was everywhere, stuffing bulged out of one of the cushions of the davenport and there was a great hole in the ceiling.

At that moment a siren wailed and an ambulance streaked southward toward the paper mill.

Upstairs in the Mills residence the police found a neat hole in the bedroom flooring, as if cut with a saw, and a waste basket sheared cleanly in two. Directly above was a splintered 8x8-in. rafter. Downstairs the newspaper boys were measuring the piece of steel, still warm. It was 15x40 in., about 1.5 in. thick and was estimated to weigh over 200 lb. What was this strange missile and where did it come from?

News travels quickly. Outside on the street they were talking about a boiler explosion at the Mead Pulp and Paper Co. In a few minutes two or three Mead officials, arriving to inspect the damage to the house, brought the explanation of what had happened.

It wasn't a boiler explosion at all. The "bomb" was half of the head of a steam turbine. Cutting loose, it had crashed through a wall in the turbine room and had rocketed four blocks to tear through a roof and two floors, to land on a davenport and roll off on a rug. Five men in the turbine room at the time were unhurt, but another, who was working nearby, suffered minor lacerations.

The general manager at the mill could offer no definite cause of the accident, but it was thought that faulty material, loose steam buckets, governor trouble or turbine overload may have been responsible.

Of course the Mead Corp. took care of the damage to the doctor's home and, except in the attic, there is now no evidence of what happened that summer morning eighteen years ago. Since that time postmen have delivered thousands of letters to the stately old houses on Caldwell Street; Doc Davison, still living, has planted countless bones in the neighbors' flower beds; and Mr. Steele has smoked hundreds of after-breakfast cigars on his front porch. The super calenders hum busily but no more buzz bombs have bombarded the doctor's house. The peace on Caldwell Street is unbroken.

NAMES IN THE NEWS

R. J. Quinn

J. C. White

P. S. Wilcox

Robert J. Quinn, of The Mathieson Alkali Works, has been elected president of the Compressed Gas Manufacturers' Association, Inc. Mr. Quinn received his chemical engineering degree from the University of Illinois in 1912 and has been with Mathieson since 1920. At the same time **Clarence McL. Pitts** was elected first vice president, **C. G. Andrew** second vice president, while **Maj. F. R. Fetherston** will continue as secretary-on-leave, and **Miss Florence Jacob** as acting secretary and treasurer.

D. Gardner Foulke has joined the staff of Foster D. Snell, Inc., as director of the analytical department. Dr. Foulke was formerly chief chemist for the Garfield Division of Houdaille-Hershey Corp.

Ivan F. Harlow has been appointed production manager for the inorganic division of The Dow Chemical Co. He has been in direct charge of the development and production of bromine and bromine compounds almost since his affiliation with the company in 1909.

Roland P. Soule has been elected vice president of the American Machine & Foundry Co., in charge of research and development.

Martin de Simo has been made vice president in charge of research and development for Great Lakes Carbon Corp. of Chicago. Dr. de Simo joined the company in 1941 and has been responsible for organizing the research division and building the company's laboratories at Morton Grove, Ill.

Ralph B. McKinney, general manager of the Paper Makers Chemical Department, and **Wyly M. Billing**, general manager of the Synthetics Department, have been made members of the board of directors of Hercules Powder Co. They fill vacancies left by **Charles C. Hoopes** and **George M. Norman**, both retiring after 32 years' service.

James C. White, vice president and general manager of Tennessee Eastman, has been made president of that organization in succession to **P. S. Wilcox** who became chairman of the board at the beginning of this year.

Edwin R. Gilliland, former Assistant Rubber Director, has been chosen first recipient of the Leo Hendrick Baekeland Award of the North Jersey Section of the American Chemical Society. Dr. Gilliland is a professor of chemical engineering at Massachusetts Institute of Technology now on duty with the Office of Scientific Research and Development. Formal presentation of the award will be made May 14.

Everett C. Gosnell, who has been chemical engineer withLukens Steel Co. since 1937, has been appointed manager, Chemical Division of Lukens and its subsidiaries, By-Products Steel Corp. and Lukenweld, Inc.

William B. Plummer has been relieved from active duty with the Army Air Forces and returned to service with Standard Oil Co. of Indiana. Lt. Col. Plummer joined the armed forces a little more than two years ago.

Paul Hugh Emmett has been added to the staff of Mellon Institute. Dr. Emmett will plan and supervise long-range investigational projects on catalysis in petroleum technology.

J. Howard Arnold, for the past seven years a member of the University of Iowa faculty, has joined the California Research Corp., recently organized research and development subsidiary of the Standard Oil Co. of California at Richmond.

G. Gordon Urquhart has been named president of Wilmington Chemical Corp. He was formerly vice president of National Foam System, Inc., and suceeds **Herbert Waller**, who recently resigned.

Perley S. Wilcox and **Herman C. Sievers** have been elected vice chairmen of the board of directors of the Eastman Kodak Co. **Charles K. Flint**, vice president of Kodak and general manager of the Kodak Park Works, was elected a director at the same time to fill a vacancy caused by the death of **Albert F. Sulzer** last August.

John G. Hildebrand, Jr., laboratory director, has been elected a vice president of Gustavus J. Esselen, Inc.

F. J. Sanders, formerly superintendent of the Toledo refinery of Standard Oil Co. of Ohio, has been placed in charge of the company's No. 2 refinery in Cleveland. Dr. Sanders will devote his time to the development and manufacture of lubricants.

L. E. Spencer, Hartsville, Ohio, has been transferred from the position of deputy director to that of consultant to WPB's Rubber Bureau.

W. L. Faith has resigned from his position as deputy director of the Office of Production, Research and Development, WPB, to join the Engineering Department, Chemical Division, of the Corn Products Refining Co.

Edmund H. Schwencke has been named director of plastic research for Roxalin Flexible Finishes, Inc.

Chester A. Fulton has resigned as president of the Southern Phosphate Corp. to engage in private practice as mining engineer.

E. C. Auchter has resigned as administrator of Agricultural Research Administration and has been succeeded by **P. V. Cardon**.

L. D. Tompkins, Wilton, Conn., formerly deputy director of WPB's Rubber Bureau, will serve as a consultant to the chairman and to the director.

R. E. Fritsch, vice president of Tube Turns in Louisville, since 1929, has been elected president to succeed the late Walter H. Girdler, Sr.

A. R. Stargardter has been appointed chief metallurgist of Ajax Electric Co. Mr. Stargardter was formerly with the Eastern Stainless Steel Corp.

L. H. James has established a consulting laboratory service in industrial microbiology in Chicago.

J. A. McBride, who received the Doctor's degree in organic chemistry from the University of Illinois last June, has joined the product development division of the Chemical Products Department, Phillips Petroleum Co. in Bartlesville, Okla.

C. M. Paisley has joined the chemical products department of Phillips Petroleum Co. located in Bartlesville, Okla. Before joining Phillips, Mr. Paisley was associated with the Northern Regional Research Laboratory at Peoria, Ill.

Robert V. Yohe, manager for the B. F. Goodrich Co., of a government synthetic plant near Louisville, has been elected vice president of American Anode, Inc., Akron, a B. F. Goodrich affiliate.

Alexander Gobus and **Charles Davidoff** have been announced vice presidents of the engineering, metallurgical and consulting organization of Sam Tour & Co., Inc. of New York. Mr. Gobus is chief metallurgist and Mr. Davidoff is a chemical engineer specializing in precision casting, electrochemistry, corrosion problems and plastics.

W. B. Hoey of Plastic Processes, Inc., Birmingham, Mich., has been elected president of the Society of Plastics Engineers. Other new officers are **W. C. Clark,** vice president, and **L. S. Shaw,** secretary-treasurer.

Peter J. Gaylor has resigned from the Standard Oil Development Co. to open his law offices in Newark where he will specialize in patent law, trade marks and copyrights. Mr. Gaylor will also publish the *Technical Survey,* a weekly service covering new developments and trends in technology.

Edward C. Elliott, president of Purdue University since 1922, will retire on June 30 under the age limit.

Alexander J. Tigges has been appointed district technical advisor of the Air Preheater Corp., with offices in New York.

Thomas W. Harris has joined the staff of Wilson & George Meyer & Co. in the agricultural and industrial chemical department. Mr. Harris was formerly with Basic Magnesium, Inc., in Las Vegas.

M. H. Chetrick, chemical engineer, has joined the staff of Battelle Memorial Institute, Columbus, where he will be engaged in chemical research. Dr. Chetrick was formerly with the Shell Oil Co. in San Francisco.

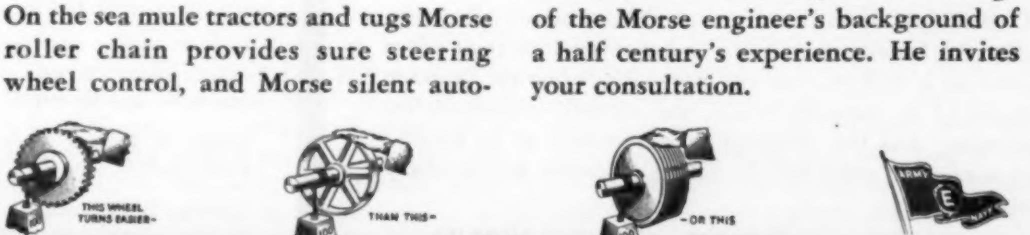
On Sea Mules . . .

CHAIN means *POSITIVE CONTROL*

When invasion calls for dependable sea mule tractor and tug operation, there is no substitute for the positive power transmission and control which only chain can provide.

On the sea mule tractors and tugs Morse roller chain provides sure steering wheel control, and Morse silent automotive timing chains on the engines help maintain smooth, trouble-free operation under severe conditions.

When you have a problem of power transmission or control, take advantage of the Morse engineer's background of a half century's experience. He invites your consultation.



SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

Willard H. Bennett has been appointed director of applied research for the Institute of Textile Technology in Charlottesville, Va.

Robert P. Fischelis has resigned his position as director of the Chemicals, Drugs and Health Supplies Divisions of the Office of Civilian Requirements to become secretary and general manager of the American Pharmaceutical Association at its headquarters in Washington. **George K. Hamill** has been named to succeed Dr. Fischelis in the OCR.

Joe W. Coffman has been appointed vice-president of the General Aniline & Film Corp. in charge of the Ozalid Division in Johnson City, N. Y.

Bernard Agruss, research chemist, has joined the staff of Battelle Memorial Institute, Columbus, where he will be engaged in electrochemical research. Dr. Agruss was formerly with the American Smelting & Refining Co., Perth Amboy, N. J.

George O. Boomer has been elected president of the Girdler Corp., Louisville, to succeed **Walter H. Girdler, Sr.**, who died last month.

Arthur E. Hecker, formerly vice president and general manager of Chemical Construction Corp., has been elected president to succeed the late **W. S. Stowell**. **Blakeslee Barnes**, a vice president of the corporation, has assumed the additional duties of general manager, and **R. E. Lapean** and **S. F. Spangler** have been elected vice presidents.

OBITUARIES

Oliver J. Hall, 57, a vice president of the Harshaw Chemical Co. for 17 years, died at his residence in Cleveland January 11.

Harry Phillips Trevithick, 58, chief chemist of the New York Produce Exchange, died suddenly on January 17.

Robert F. Carr, 73, chairman of the board of the Dearborn Chemical Co. and former president of the University of Illinois Board of Trustees, died January 22.

Clarence B. Cluff, 68, consulting chemist and head of the Procter & Gamble patent department died January 24.

Max J. Proffitt, 59, chemical engineer with the Sugar Section of the Bureau of Standards, died January 25.

Eshelby F. Lunken, 54, president of The Lunkenheimer Co., died January 25.

Clarence W. Warner, 47, president of the Maltbie Chemical and Pharmaceutical Co. of Newark, N. J., died February 4.

George H. Mettam, 55, a director of Standard Oil Co. of N. J., died February 6.

Charles F. Burgess, 72, well-known chemical engineer and inventor, died February 13.

REDEDICATION

An Obligation to Our Fighting Men

During the last few weeks we have been forcibly reminded that so long as we still are fighting either of our major foes, first claim upon the productive resources of the United States—its manpower, materials, utilities, and industrial facilities—must be the production and delivery of munitions and war supplies. All other claims are secondary. No responsible citizen would have it otherwise. For in this war even more is at stake than our existence as a Nation. We dare not forget that we are engaged in a struggle that challenges the fundamental values upon which our civilization has been built.

It is not easy to list the values that we are fighting to uphold. They have been clothed in a variety of shapes over the centuries. They will assume new forms in the years ahead. But they have an inner consistency that free men the world over can feel and recognize: the right of the commoner against the noble, the right of the individual against the state, the right of trial by jury, the right to vote, the right to an education, the right to freedom of speech and worship, the right to work in a sphere of one's own choosing, the dignity and the equality of the individual under the law—these are our cultural heritage, painfully won and often precariously held over the ages, always to be rewon, redefined and buttressed by each succeeding generation of men.

The preservation of this vital core of value, and its transmission to our sons and daughters depends upon our victory in this struggle. So those things which are essential to victory must come first. And since the production of war munitions in overwhelming volume and quality can hasten that victory and save countless lives of our fighting men, no effort that will contribute to this end should be regarded by us as a sacrifice.

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The present is no time for self-congratulation upon our achievements either in the theatres of battle or of production. The mounting casualty lists should suffice to curdle the savor of any such indulgence. The most that can be said in reasonable taste and good conscience is that performance in both fields is such as to warrant our firm confidence that we can carry to successful completion the tasks that remain to be done.

Nor is there profit in even observing, much less deploring, that the tasks ahead are more formidable than those which were defined for us a few short months ago. Then, all of us—military leaders, government officials, workers, and business men—were riding a crest of optimism as to an early end of the war in Europe and as to the character and dimension of the war against Japan. Already we had begun to turn anxiously toward the problems of reconversion which then seemed so near at hand. Schedules for war production, based upon the best available estimates of need, called for a 5 billion dollar reduction from 1944 performance, even though we might have to continue a two-theatre war, and for a 40 percent reduction in the event of an early victory in Europe.

Today, those forward estimates have been revised sharply upward. That is true both of the 1945 requirements to meet the needs of a two-theatre war, and of requirements for the Pacific war once the European phase is ended. For this upward revision four chief reasons are responsible:

1. European battle experience has shown markedly greater use of expendable munitions than was provided in the formulae upon which our original production schedules were calculated: the result has been a depletion of inventories on a scale that would become dangerous if allowed to continue.
2. Experience has also demonstrated the need for new types of weapons or increased complements of some existing types to match new enemy equipment or tactics.
3. A less easy optimism as to the early ending of the European war has given rise to a growing disinclination to gamble on the approximate date.
4. An increasing conviction prevails that the war against Japan may require ground-army operations on the Asiatic mainland on a scale greater than originally premised.

But if these changes in the fortunes and outlook of war have raised our estimates of military requirements, may not subsequent favorable changes in the military situation cause them again to be revised downward? It is entirely possible. But our military men have learned that they cannot safely discount what *might desirably happen* as something that *will happen*. Those working on the production front also must learn that lesson. Fortunately, the record shows that we have been able to maintain a war production almost equal to that of the rest of the world combined, even while we produced for civilian use on a scale that has been large even by our

own pre-war standards. So we have ample margin to whip whatever war job may be required of us. As now defined, the task will not be easy. But it *can* and *will* be done.

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What, then, is the production task with which we are charged? Our 1945 production for the two-theatre war now calls for the substantial maintenance of the over-all levels reached in the latter months of 1944. But there is a shift of emphasis. Almost half of the programs for specific equipment items are declining. A few are scheduled to hold level. About 45 percent are scheduled to rise sharply. That means that workers and facilities must be shifted to man the expanding programs. At the same time the armed services are calling for many more men than can be supplied from those who become newly eligible to the 18 year old age group. That means further drafts upon war workers. It means also replacements for them when they are taken from the expanding programs. Finally, events demand that we produce as much as possible of many items during the first half of 1945.

Our task, then, is one of intensified effort for the immediate future, with multiple readjustments at a stage when adjustments are hard to make. Materials for which demand was easing as pipe-lines were being drained in anticipation of falling schedules again are tight as the pipe-lines are being refilled to meet augmented requirements. Men, women, and facilities must be shifted from less essential to more essential tasks. What must be done will be done. But unless there is much voluntary accommodation, it will be necessary for us to suffer a formidable amount of governmental direction which none of us likes, many of us deeply resent, and all of us, when personally affected, volubly protest. The more we police ourselves, the less we shall be policed.

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Even after Germany has been defeated, we shall still face a far from light production requirement to continue the war against Japan. As currently defined this phase might require war expenditures at something like $70 billions a year, an over-all reduction of approximately 20 percent from the $89 billions spent in 1944. Reduction in munitions output would be somewhat greater, probably from 25 percent to 30 percent below 1944 levels. But it is important for us to acknowledge that the reduction is going to be substantially less than the 40 percent previously estimated.

Only a few months ago there were those who questioned sharply the possibility that we might need 60 percent of current munitions output to win the Japanese war. Now the judgment of the military is that 70 percent will be none too high.

Actually the latter level would represent an increase of little more than 50 percent above what now is being produced for the Pacific area. This, certainly, is a modest estimate when we reflect that we shall inevitably more than triple the Army forces assigned to that theatre.

Such a program probably would give us a current munitions supply from three to four times that produced by Japan, but it is believed that we shall need that much to compensate for the advantages derived by Japan from the fact that she will be fighting a defensive war, from the volume of her accumulated stores, from her prepared positions, her shorter lines of supply and transport, and from her large troop reserves, the bulk of which we have yet to meet in battle. Certainly our present 3 to 1 production edge over Germany does not appear to be excessive.

The more modest V-E Day cuts contemplated by the present plan will mean a less acute reconversion problem when they are made, but will leave a greater one to be met at the end of the war. They will mean probably a net increase of not more than 4 million workers available for civilian work during the transition period. Their orderly absorption should present no embarrassing problem. Indeed, we now are warned by Washington that war production following V-E Day may require the protection of considerably closer control than was contemplated under the 40 percent cuts previously expected.

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In short, we face for the immediate future a more difficult production job. It is made the more formidable by the fact that we had dulled the keen edge of our will to produce by our premature expectation of a reduction in requirements. Now we are told that the trend of war production for the immediate future is up, that it is unsafe to discount the date of victory in Europe, and that the amount of leeway for reconversion after the defeat of Germany is less than had been anticipated.

Accordingly, we must rededicate ourselves to the task of driving war production up. We must do without some of the things that we have enjoyed on the civilian front rather than demand more of those things; we have still to devote our abilities and energies first and foremost to the demands of war.

Whatever will assure and hasten victory must have first place in any statement of American policy.

Without victory, our aims, and the underlying values upon which they are based, will be extinguished, blotted out by the opposing aims and values proclaimed by our enemies.

The needs of our fighting men must be put first. For, unless we win the war, the National aims and policies of the United States will cease to have meaning in the world.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 32ND OF A SERIES

INDUSTRIAL NOTES

Blackmer Pump Co., Grand Rapids, has appointed Fred T. Kennedy as general manager. He had been connected with the War Production Board in Washington.

American District Steam Co., North Tonawanda, N. Y., has appointed General Meters & Controls Co., 205 West Wacker Drive, Chicago, its representative in northeastern Illinois and northwestern Indiana.

Continental Can Co., New York, has elected Hans A. Eggers to the board of directors and made him vice president in charge of the paper container division.

Cardox Corp., Chicago, has transferred J. H. Krallmann to New York where he will serve as district manager for New England, eastern New York, and northern New Jersey. He is succeeded at Cleveland by William C. Powell.

Wickwire Spencer Steel Co., New York, has named H. C. Allington assistant general sales manager of the Wickwire Spencer Co. and its subsidiary the American Wire Fabrics Corp.

De Laval Steam Turbine Co., Trenton, N. J., has added Charles C. Bray to its staff in the capacity of assistant to the manager of the worm gear division.

American Car and Foundry Co., New York, has placed R. A. Williams in charge of sales to succeed William L. Stancliffe resigned.

Standard Oil Co. of Indiana, Chicago, has promoted Roy F. McConnell to the position of vice president in charge of sales to succeed Amos Ball retired. H. E. Hanson succeeds Mr. McConnell as general manager of sales.

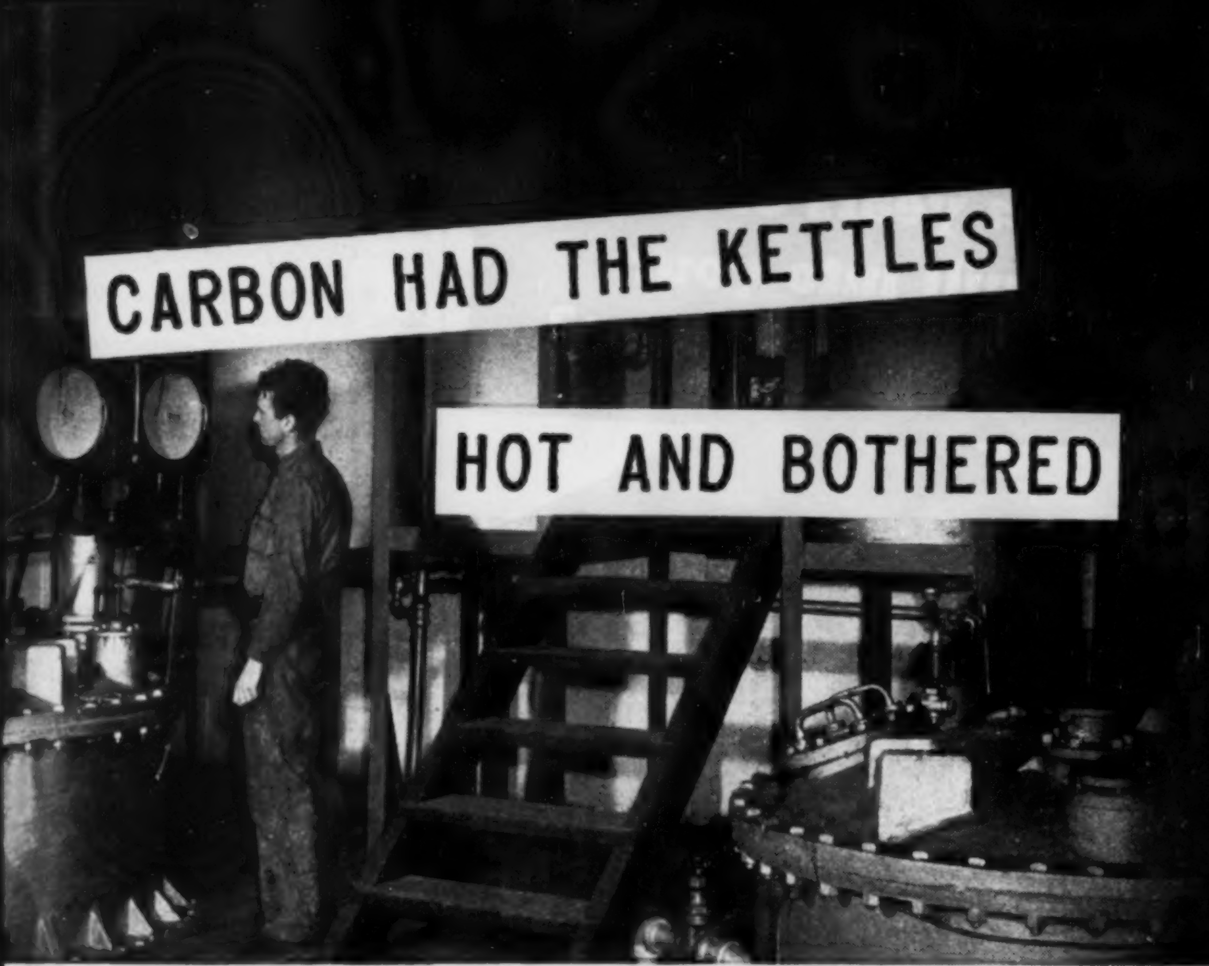
United States Rubber Co., New York, has appointed H. S. McPherson of St. Louis, midwestern sales manager of the mechanical goods division. W. M. Ballew of Kansas City, Mo., has been shifted to the position of southwestern sales manager.

Carrier Corp., New York, has announced that after January 22 the international division of the company would be located at 122 East 42d St., New York.

Fisher Governor Co., Marshalltown, Iowa, has appointed Allan K. Cook as its exclusive sales and engineering representative in western Kentucky and southern Indiana. He will make his headquarters at 505 South Third St., Louisville.

Northern Equipment Co., Erie, Pa., has installed W. L. Hunter as chief engineer.

CARBON HAD THE KETTLES HOT AND BOTHERED



SUN PROCESS OIL... Made Possible Uniform, Uninterrupted Heating, Eliminated 91% of Down-Time for Cleaning Out Oil Jackets

An organic dye manufacturer heated glass-lined kettles with hot oil, pumped through jackets. The process required exact and uninterrupted maintenance of temperature.

But hard carbon formed constantly on the linings of the jackets, changing the rate of heat transfer, and insulating the kettles so that the oil temperature had to be raised.

Frequent shut-downs were required to clean out the coke which built up and prevented circulation of the oil.

When fire resulted from the high temperature, a Sun oil engineer was called in to see if he could correct the situation. He recommended a special Sun processing oil with a low carbon content. The small amount of carbon residue formed is soft and fluffy, and easily removed when oil is changed.

Operating records for the last two years show that with this Sun oil make-up requirements have been reduced 66%, and that "down" time for cleaning out coke and replacing oil has been cut 91%.

The know-how and experience that enabled the Sun engineer in this case to bring about continuous, uniform, low-cost heating, are available to help you. Whether you require process oils, solvents, fuel oils, lubricants or other petroleum products, Sun engineers and Sun quality products are a combination that you should know about. For further information, write to . . .

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SUNOCO

SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTRY

He will supervise engineering, design and research.

Glascote Products, Inc., Cleveland, has appointed Frank C. Patera sales manager to succeed W. C. Dunlap resigned.

The Warren Steam Pump Co., Warren, Mass., has placed William R. Hill in charge of industrial and commercial sales. The federal and marine departments remain in charge of H. Ward Hathaway.

Dow Chemical Co., Midland, Mich., has announced the appointment of Robert E. Bockrath as manager of magnesium sales for the company's Houston office.

Gardner-Denver Co., Quincy, Ill., has established the main office of its export division in the Woolworth Bldg., New York, with G. V. Leece in charge.

Phillips Petroleum Co., Bartlesville, Okla., has transferred T. M. Underwood from the Borger refinery to the chemical products department in Bartlesville where he will be occupied with process design and engineering.

Hewitt Rubber Co., Buffalo, recently announced an expansion program which will include entrance into the field of producing latex foam and molded rubber articles for use in industry.

Westinghouse Electric & Mfg. Co., East Pittsburgh, has established a New England district for the lamp division field organization and appointed George H. MacGilvray as district manager. He will continue to supervise customer relations in New England from his former headquarters at 10 High St., Boston.

Blackmer Pump Co., Grand Rapids, Mich., has appointed Jose Maria Fierro general representative for the company in all of Mexico. He had been acting as representative in Mexico City and vicinity.

General Ceramics Co. Keasbey, N. J., is now represented in the central states by F. M de Beers & Associates, chemical engineers, with headquarters at 20 North Wacker Drive, Chicago.

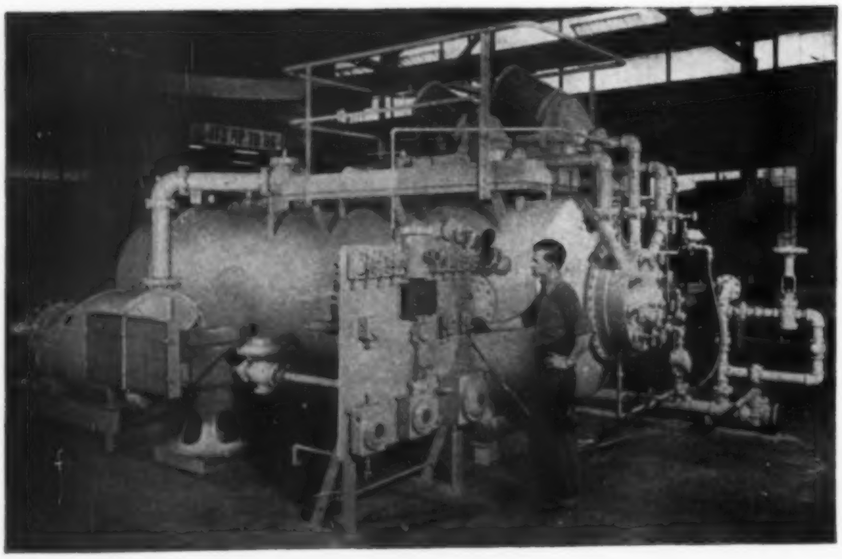
Edward Ermold Co., New York, has made Edgar Hubert sales manager in the New England district with offices in the Statler Bldg., Boston.

Hooker Electrochemical Co., Niagara Falls, has promoted John S. Coey to the position of manager of its sales development department.

General Controls Co., Glendale Calif., has selected James King as field sales engineer in its factory branch at 101 Park Ave., New York.

U. S. Gauge Co., Sellersville, Pa., has relocated its Chicago office at 53 Jackson Blvd., under the direction of Walter H. Magee.

Crawford, Callen & Co., 350 Madison Ave., New York, has been formed to engage in import and export trade in chemi-



cals and related products. Members include Frank E. Crawford William Callen, and George Simon.

Morse Chain Co., Ithaca, N. Y., has elected Walter W. Bertram vice president in charge of sales and has appointed Robert J. Howison sales manager.

The Lunkenheimer Co., Cincinnati, has named Frank P. Rhame general manager to succeed Charles A. Brown. Carra L. Lane has succeeded George A. Seyler as works manager and Fred H. Hehemann has succeeded Jerome J. Aull as chief engineer.

Worthington Pump and Machinery Corp., Harrison, N. J., has elected Clarence E. Searle president. Howard C. Ramsey, vice president in charge of operations is now executive vice president and Edwin J. Schwanhausser is vice president in charge of sales.

The Davison Chemical Corp., Baltimore, has moved its office in Chicago to 43 East Ohio St. M. H. Baker will serve as Chicago field service representative for the industrial chemicals department.

The Foxboro Co., Foxboro, Mass., has appointed Wendell A. Melton district manager in the Tulsa territory with headquarters in the McBirney Bldg., Tulsa, Okla.

Heresite & Chemical Co., Manitowoc, Wisc., has appointed Earl W. Haugh general sales manager of the company.

The Vilter Mfg. Co., Milwaukee, has advanced Ludwig E. Loos to the position of manager of purchases. Mr. Loos joined the purchasing department in 1936.

Hercules Powder Co., Wilmington, has opened a district office in the Statler Bldg., Boston, for the naval stores department with A. H. Sanford as manager.

Monsanto Chemical Co., St. Louis, has made William M. Russell branch manager of the organic chemicals division for the Detroit territory.

Duane Chemical Machinery Co., 51 Franklin St., New York, has been formed to repair, rebuild, and service machinery. The company is headed by I. B. Cytron.

The Thibaud & Walker Co., Long Island City, has appointed William E. Sigafoose southern sales manager with headquarters in Atlanta and has made Roy W. Westman western sales manager with headquarters at Chicago.

Empire Chemical Corp., 20 Exchange Place, New York, has been established by George M. Dunning, Jr. to handle a varied line of industrial chemicals.

The Metal and Thermit Corp., New York, has elected F. H. Hirschland chairman of the board and Frank J. O'Brien president.

The Procter & Gamble Co., Cincinnati, has purchased the patents, trade marks, and good will of Spic & Span Products of Saginaw, Mich.

CONVENTION PAPER ABSTRACTS

CONTENTS

ENTOMOLOGISTS' OPINIONS ON DDT

NEVER in the history of entomology has a chemical been discovered that offers such promise to mankind for relief from his insect problems as DDT. There are limitations and qualifications, however.

Subject to these, this promise covers three chief fields: public health, household comfort, and agriculture. As public health we include control of the insects which carry diseases that have scourged humanity, such as malaria, typhus and yellow fever. Household comfort is taken to cover such things as flies, fleas, bedbugs and mosquitoes. Agriculture includes not only farms, gardens and orchards but forests, livestock and poultry.

In the public health field DDT insecticides are so much more effective than previous weapons against malaria mosquitoes that for the first time there is a practical hope for eradicating that disease from this country. DDT proved in Italy that it is the first and only practical control for typhus. In the household field its amazing lasting effect promises relief for months from flies, mosquitoes and fleas. In the case of bedbugs, eradication from the American home has become a possibility.

In agriculture, it is promising against a wide variety of destructive pests. These include most potato insects, many orchard and vineyard pests, numerous vegetable insects, as well as the chief insect enemies of vitally important seed crops. It appears to be effective against the pink bollworm and outstanding against the Japanese beetle, two of our worst imported pests. It promises also a more practical control of the pests which ravage thousands of square miles of forest, and against many of those which harass livestock.

DDT will not kill all the important insect pests. It will kill many beneficial insects which are allies of mankind against the destructive species. Because of its toxicity to a wide variety of insects, its large-scale use might create problems which do not now exist. To illustrate, it is a superior insecticide for control of codling moth on apples, but in some sections at least will kill certain natural ene-

TRANSPORTER
Platform Lift Truck

- POSITIVE MECHANICAL BRAKE
- CONTROLS IN STEERING HANDLE
- FORWARD AND REVERSE SPEEDS
- FRONT WHEEL POWER DRIVE
- SHOCKLESS HYDRAULIC PLATFORM
- LIFT WITH EASY FOOT CONTROL
- "DEAD-MAN" CONTROL

•

NO → *STRAINING*
→ *TUGGING*
→ *PULLING*
→ *PUSHING*

A HANDY TIME-SAVING WORKER IN ALL PARTS OF THE PLANT

Whether it's bulk materials, parts, or package goods, the TRANSPORTER makes easy work of hauling — to and from cars — in and out of storage — all along the processing line.

It's no trouble at all for women to transport tons — inexperienced help becomes highly efficient handlers of materials.

All the trucker does is guide the load — he controls its movement (forward or reverse) (brake and speed) through the handle. The TRANSPORTER is maneuverable in congested places. It has a wide turning range.

Write for details.

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Division of the Yale & Towne Manufacturing Company

mies and thus release other insects which may then become major problems.

The research reports emphasize that we have not had time to develop entirely satisfactory mixtures and dosages of DDT insecticides, nor the method and timing of application for many possible uses. Modern agricultural pest control often requires mixing several materials in combination treatments, and we know little of DDT's compatibility with many of these others. Researches thus far were made with a material which was produced under pressure for military needs, and which is not necessarily the best form for agriculture.

We do not know enough about effects on plants, animals and soils. While most plants were not harmed by DDT insectisides in the experiments, injury to squash, corn, tomatoes and possibly fruit trees was reported. DDT is toxic to animal life when large amounts are taken internally or absorbed through the skin from oil solutions, but reports indicate a reasonable margin of safety. In the light of our present knowledge, heavy deposits on edible parts of plants should be avoided. Reports show definite toxicity to cold-blooded animal life including fish and frogs. There has not been time to learn the possible cumulative effects on soils.

More and larger-scale experimentation is needed. Enough DDT for such research in 1945 should be provided.

Statement adopted by and issued at 56th annual meeting, American Association of Economic Entomologists, New York, Dec. 15, 1944.

WARTIME TRENDS IN ELECTROCHEMICAL INDUSTRIES

MANPOWER shortages continue to plague our industry especially in Northern New Jersey, Philadelphia, Baltimore, Chicago, and St. Louis. At least 50,000 more workers are needed in chemical plants, performing a vital role in war production, to raise employment to 750,000 persons.

Industrial chemistry has before it the period of its greatest growth, and chemistry and physics will come ever closer together in their industrial applications. Electronics is electrochemical evidence of that. So, too, are the almost revolutionary advances being made in X-ray diffraction, the mass spectrometer, and the other great research developments that are at last becoming useful tools for industrial processes. It is in these important fields, intermediary between chemistry and physics, that the electro-chemist can be of greatest service to the progress of industry.

The last year has marked the greatest electrochemical achievement since the days of Faraday, but these developments still are war secrets. Electrochemists are in a most strategic position to serve in the postwar development of the great new industries of this country. And they are the ones that will provide employment and enhance our living standards. Recent advances in electrochemistry, have helped to break down the barriers between the technologies, and from this will emerge a new functional "electrochemical engineering" that can be of vast service to all industries of the future.

WPB figures show that the chemical

and allied products industry in 1944 achieved the highest production level in its history, reaching a record output valued at $8,300,000,000 or roughly two and one-fourth times the output of 1939. The increase from 1943 was more than 10 percent, and from 1942 more than 30 percent. It is very much to the credit of the management and technical personnel of our industry that never once has the nation's rapidly expanding war production program been seriously held up by the lack of strategic chemicals. Even when the military authorities suddenly revised their estimated requirements for heavy artillery ammunition, rocket powder, and the like, there was no faltering on the part of the chemical industries involved.

By WPB estimates we have actually constructed about $1,500,000,000 of new chemical plant facilities since 1939. The authorized program totals $1,700,000,000 which was 88 percent completed by the year's end. We are spending today at the rate of $12,000,000 a month, or an estimated $150,000,000 for 1945.

Of the total authorized construction, WPB estimates that about $500,000,000 will be the cost of chemical plants erected as part of the synthetic rubber program. Army ordnance accounts for approximately $350,000,000 and Chemical Warfare Service adds another $50,000,000, leaving some $800,000,000 for chemicals that are not directly used in munitions of war. That is significant, for it practically doubles the prewar investment in these industrial chemical plants.

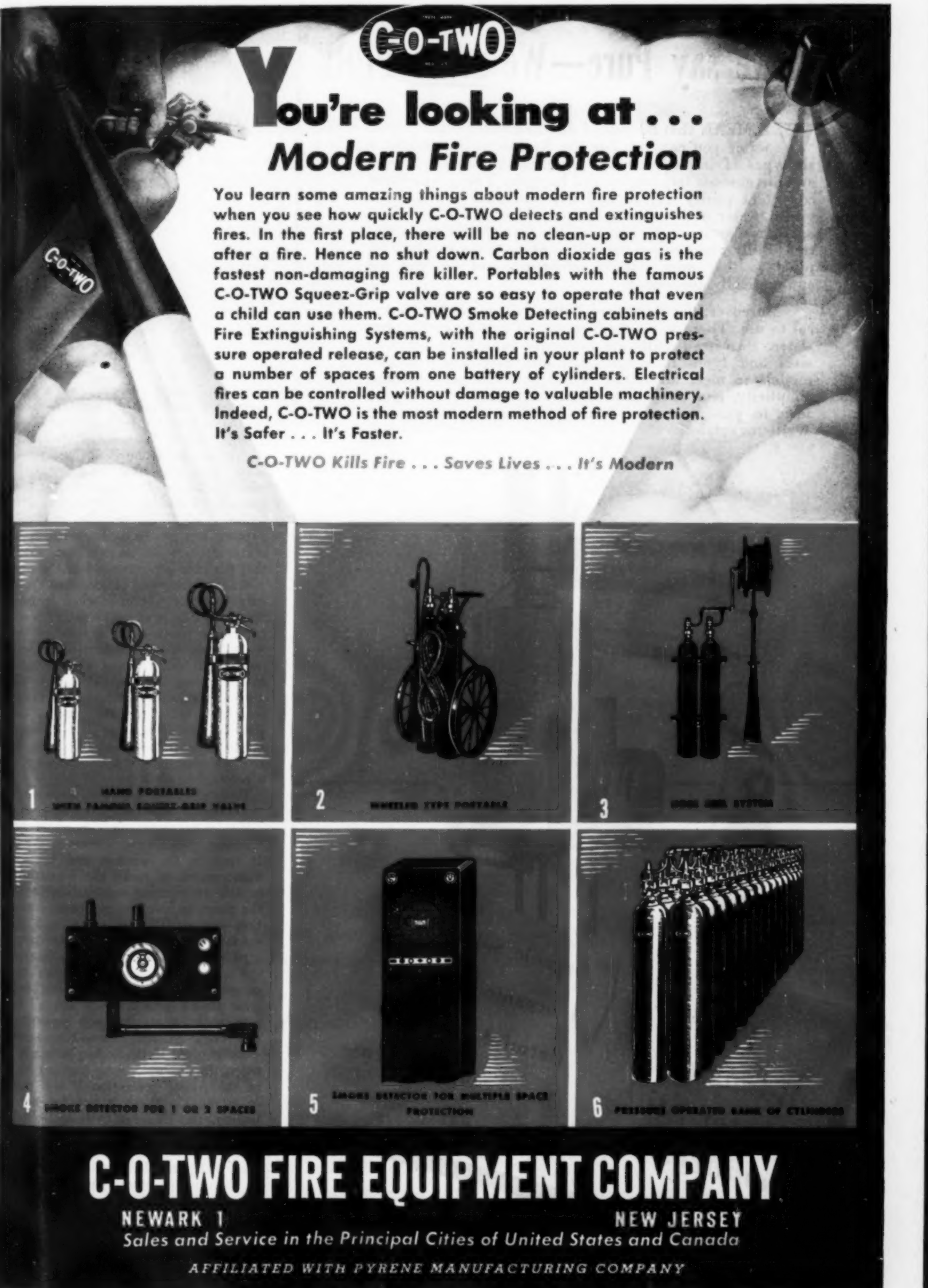
In chemical engineering education, the last four years have brought a drastic drop in undergraduate enrollment and today the situation is even worse. As a result we face a great deficit of adequately trained men which will continue to be serious even when the war industries and the armed services release their excess personnel.

S. D. Kirkpatrick, *Chemical & Metallurgical Engineering*, before joint meeting of Detroit Sections of the Electrochemical Society and American Chemical Society, Detroit, Jan. 22, 1945.

SILICONES FOR INSULATING ELECTRICAL MACHINES

It is important to recognize that the use of silicone resins in electrical insulation need not represent any radical departures from well established practice. Inorganic components of high temperature insulation have long been available and their characteristics proven. It was the organic bonds, impregnants and surface treatments which limited the thermal endurance of composite insulation containing mica, asbestos and fibrous glass. Silicone resins should be used in combination with these well known materials. References made in this paper to "silicone insulation" imply the substitution of silicone resins for all the organic resins in the better grades of Class B insulation and do not refer to the use of silicone resins as mica substitutes in any way.

Innumerable tests in the laboratory and over fifty years of service experience have demonstrated that thermal aging is the most important single factor in insulation life. Only after such aging occurs



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good insulation became vulnerable to the other ills which plague it. Differences in the thermal endurance of various types of insulation have been clearly demonstrated to be a function of the stability of their essential components. Therefore, the recent development of silicone resins promises great improvement in thermal stability of insulation for electrical machines as it improves the weakest link in the insulation system.

T. A. Kauppi and G. L. Moses before American Institute of Electrical Engineers, New York, Jan. 22-26, 1945.

AMERICAN RESEARCH

Greatly increased research programs, designed to make up the lost time in improving the American standard of living, will be launched by the chemical industry once its laboratories have been relieved of war duties. But this expansion faces the grave war-caused handicap of a serious shortage of well-trained chemists—a shortage that will be felt for a number of years.

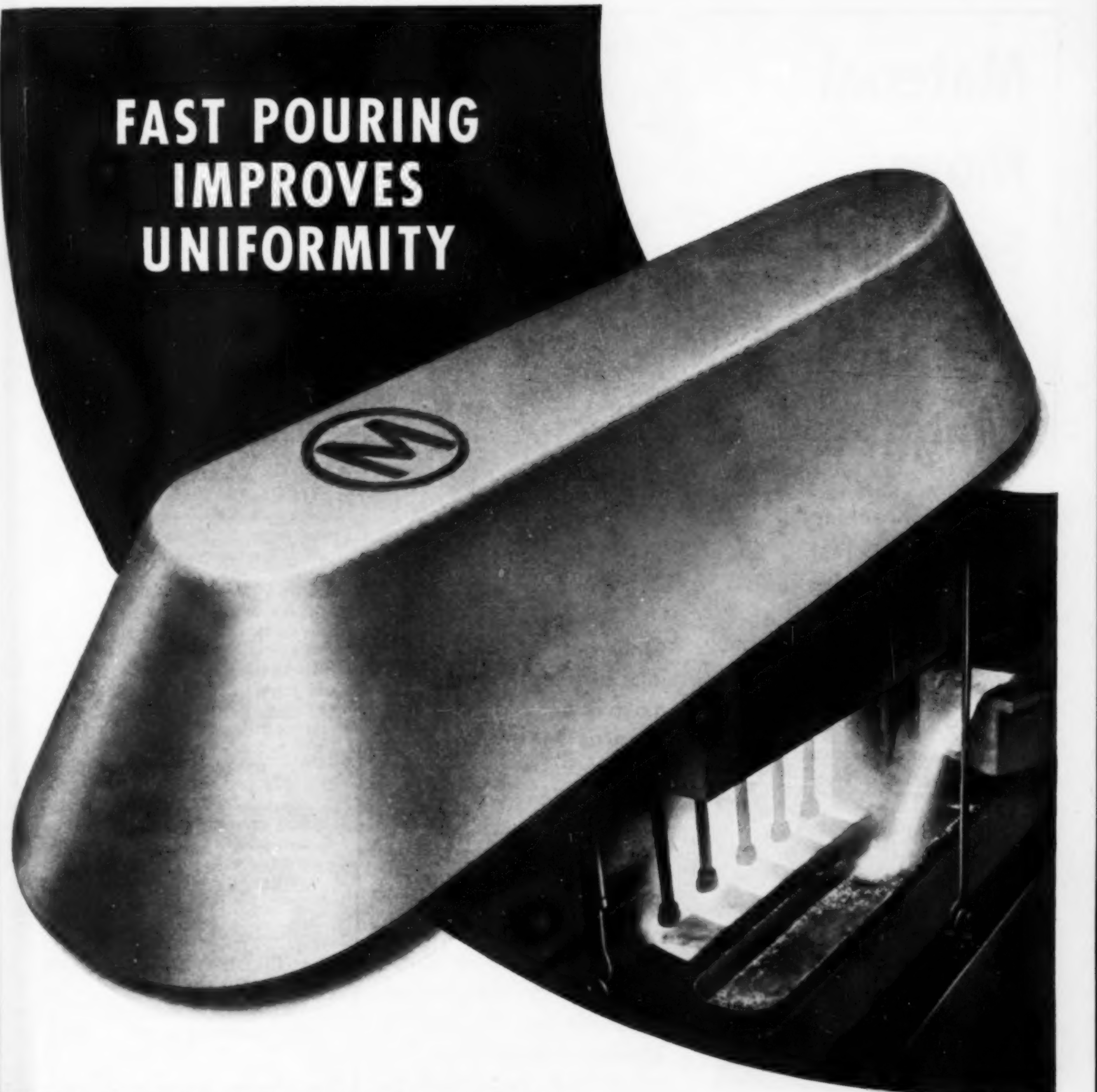
Since World War I, the chemical industry has made remarkable progress due in a very important measure to the friendly attitude of the government toward research. Granted a continuation of this attitude, organized research will go on creating new products, for what remains to be done is far greater than anything that has been accomplished in the past.

Research becomes of service in the ordinary walks of life only when it can be translated into processes or products which contribute to raising the scale of living, to the improvement of health, to the promotion of industry and agriculture, and to the national defense. The great store of scientific knowledge which has been accumulated in the past through the careful painstaking investigations of countless scientists becomes of value to society when research points the way to harnessing it to a practical application.

It should be emphasized, however, that the research organization is only part of the team necessary to bring the fruits of scientific work to the service of mankind. It requires the wisdom and courage of management to make the investment, a capable enigneering organization to design the plant, an able and experienced production organization to make material of marketable quality and suitable cost, and a sales organization to develop markets.

From the Colonial days down to the present, our patent system has been a great stimulus to research and an incentive to the creation of new products and proccesses. Large expenditures such as were involved in developing neoprene and nylon, for example, were justified because of the patent protection it was possible to establish. Were it not for this protection, the stimulus to research and invention would be greatly diminished, whether by an individual, by small business, or by so-called big business.

There is one other element that should be mentioned. It is public support and favor, which must be earned. It must be earned by operating in the public interest. Without it team effort is foredoomed. Since the advent of organized industrial research, modern industry has



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advanced human knowledge in a way that was previously impossible, and beyond that, it converts the newly gained knowledge into a higher standard of living far more quickly and on a larger scale. Today, the achievements of modern industrial research have led the American people not only to accept the new, but to expect and demand it.

Elmer K. Bolton, E. I. du Pont de Nemours & Co., Perkin Medallist, before American Section of the Society of Chemical Industry, New York, Jan. 5, 1945.

VITAMIN PRODUCTION

It has been estimated that the production of thiamin, riboflavin, niacin, and ascorbic acid is, at present, around 1,250 short tons in 1944. The U. S. civilian will receive for all purposes 53 percent. Of the remainder, 14 percent will go to the armed forces and war services, and 35 percent to allies, liberated areas and friendly nations.

From 1935 onwards, the scientific workers in the fine chemical industry have been reinforced by a steady influx of chemical engineer, whose obsession for large-scale, low-cost production has been put into synthetic vitamins.

Other than increased requisitions for vitamin A and vitamin D, the chief demands for vitamins in combating deficiency diseases are thiamine, riboflavin, niacin and ascorbic acid. The vast requirements for these vitamins are being met, in part, by increased synthetic production whose economical progress is witnessed by the ever decreasing costs to the consumer.

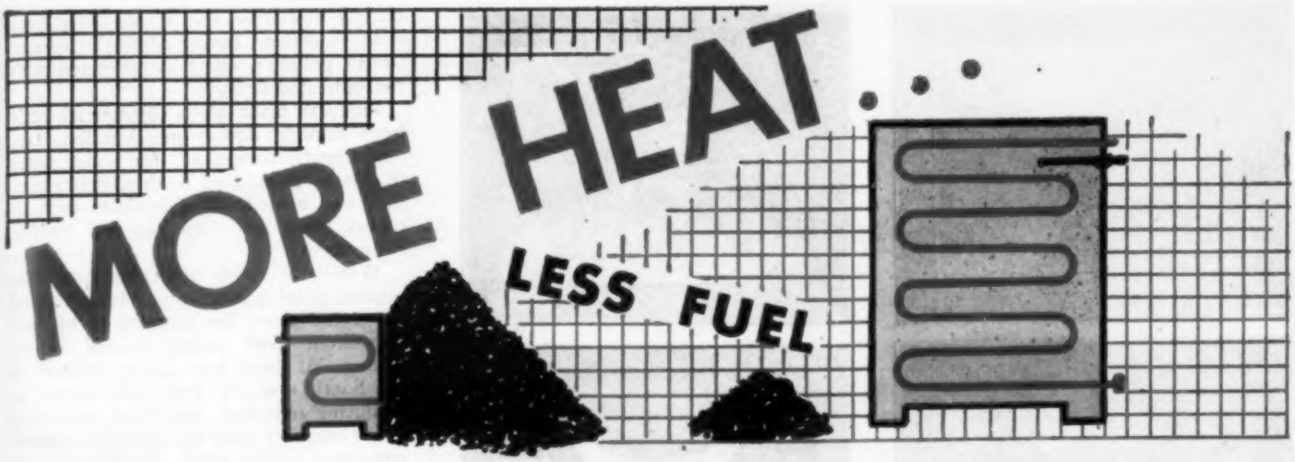
The production of pure synthetic vitamins in ton lots requires a large closely integrated staff of research chemists, skilled engineers and trained workmen and a well-informed management totally sympathetic with the aims and ideals of chemical research.

C. R. Addinall, Merck & Co., before National Industrial Chemical Conference, Chicago, Nov. 16, 1944.

SALABLE BYPRODUCTS FROM PAPER MILL WASTES

One of the world's greatest industrial wastes is sulphite liquor. According to recent estimates, this amounts in a loss of 4½ million tons of waste liquor solids per year in the United States and Canada alone. It is a nuisance because it depletes the normal content of oygen in water and may, therefore, cause the death of fish. There is an ever-increasing public pressure opposing stream pollution, which in instances has become so great that some mills have either been obliged to close or find suitable methods of reducing the pollution.

Attempts to utilize the materials in waste-liquor, have been numerous and many patents have been issued covering all kinds of applications. At one mill in Wisconsin, the sulphite liquor is commercially processed by progressive precipitation with caustic lime under specially controlled conditions. About 90 percent of the total liquor is segregated for treatment, the remainder diluted with wash water passes to the sewer. By this procedure the lignin and carbohydrate constituents are more or less completely segregated for com-

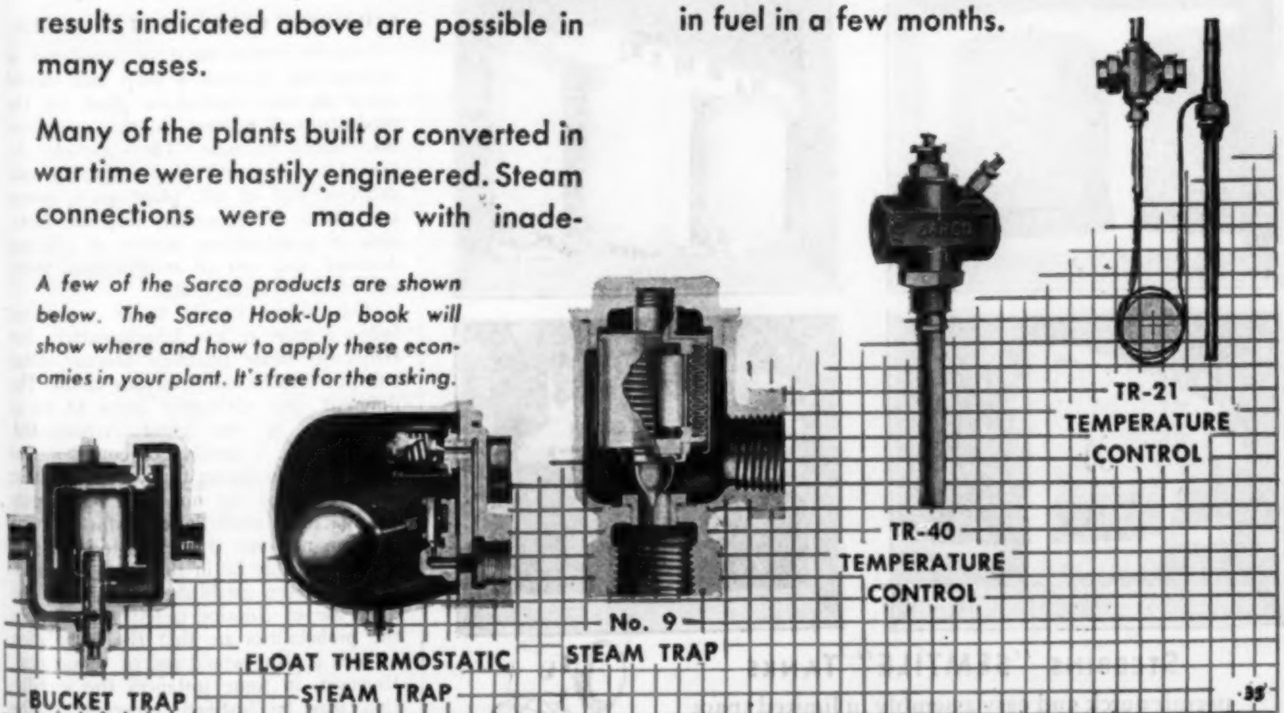


with correct steam traps and temperature control

When a coal company uses Sarco Control at the mouth of the mine to save fuel, there must be a reason. When textile, plating, chemical and scores of heavy heat using industries tell us that their output with existing process equipment was materially increased with correct steam traps and control, we know that the results indicated above are possible in many cases.

Many of the plants built or converted in war time were hastily engineered. Steam connections were made with inadequate help and frequently the right steam traps and control were not even available in the time allotted. Already Sarco engineers have found many cases where the addition of a few dollars' worth of steam traps can increase the production of equipment that cost many thousands of dollars and save their cost in fuel in a few months.

A few of the Sarco products are shown below. The Sarco Hook-Up book will show where and how to apply these economies in your plant. It's free for the asking.



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mercial utilization and at the same time yield an effluent having a greatly reduced stream pollution effect as compared with the untreated liquor.

Products made on a commercial scale from sulphite liquors are: Vanillin, tanning agents, compounds for boiler water treatment, glues, road binders, lignin plastics, and miscellaneous products such as rubber fillers and dispersing and emulsifying agents.

While the waste materials from the sulphite pulping process have been utilized for several years, the recovery of byproducts from kraft wastes is still in its infancy. At least four plants located in the South now use kraft mill wastes in producing industrial soaps and oils, from which are made such byproducts as asphalt emulsifiers, inks, paints, varnishes, core oils, cutting oils, plasticizers, resins, flotation agents and rust-proofing compounds.

The basic material for the manufacture of the soaps and oils is tall oil, the most important waste material in the kraft process. About 50 pounds of tall oil worth $36 to $42 per ton can be obtained per ton of pulp produced.

The products described as being recovered commercially as salable byproducts of the paper pulp industry, account for only a small fraction of the total tonnage of organic materials available in waste liquors.

E. G. Meiter, Employers Mutual Liability Insurance Co., before 33rd National Safety Congress, Chicago, Oct. 5, 1944.

CHLORINE CELLS IN PULP MILLS

VARIOUS factors must be considered in determining whether a pulp mill should install its own electrolytic plant for the production of gaseous chlorine or should buy liquid chlorine. They include delivered cost of liquid chlorine to pulp mill; delivered cost of salt; plant space; power and steam; labor; caustic disposal; materials of construction; nature of chlorine demand; and cost of amortization, taxes, and other overhead items.

The factors usually to be considered follow a more or less definite pattern but frequently some relatively obscure detail will prove to be the governing factor. The different cases ultimately prove to be as individual as the plants represented. Furthermore, a number of considerations must be made during this war period that in peace time do not exist. The pulp manufacturer must look at his chlorine problem not only as it exists today but as it will probably be in the postwar period.

It has been established that when the daily use of chlorine is less than 7 tons the probabilities are that the installation of such a plant would not be economical. However, in some instances the installation may be justified, especially if the caustic soda produced is self-consumed and replaces purchased caustic soda. In such cases complete study of the entire situation should be made. Items such as available power for cell operation, steam for evaporation of cell liquor, available supervision, space for the plant, depreciation, interest on investment, etc., must be thoroughly investigated. On such a small plant (7 tons daily) the supervision, taxes,

and depreciation may be so large as to increase the cost of the chlorine to a level higher than that of purchased chlorine.

If more than 7 tons of chlorine are consumed daily, just as much care must be taken with the preliminary studies, especially if the pulp mill is near to a producer of liquid chlorine.

Philip B. York, The Champion Paper & Fibre Co., before The Electrochemical Society, Buffalo, Oct. 12-14, 1944.

SYNTHETIC SALT CAKE IN KRAFT PULP PRODUCTION

In making kraft pulp, the conventional procedure has been to add salt cake to the black liquor, and burn the mixture in a smelting furnace. This treatment reduces the salt cake to sodium sulphide, and the organic soda sulphur compounds in the back liquor to sodium carbonate and sodium sulphide. The smelt thus obtained is dissolved in wash water, forming green liquor, which is then causticized with lime. Caustic soda is formed from the sodium carbonate, and the sulphide is left intact.

Synthetic salt cake is an intimate fusion of sulphur and soda ash in the correct molecular proportions and does not need to be smelted. It may be added directly to the green liquor in the dissolving tank. Solution is readily effected, and the cooking liquor which is formed upon subsequent causticization gives results comparable to those obtained from liquor made in the usual manner.

Ordinary cooking liquor consists mainly of sodium hydroxide and sodium sulphide. The liquor usually contains also small proportions of sodium carbonate, sodium sulphate, sodium thiosulphate, and polysulphide. The sodium polysulphide present, however, has generally been regarded as either useless or actually detrimental.

In contrast with this theory of kraft pulp chemistry, the solution of synthetic salt cake in the green liquor gives chiefly sodium polysulphide rather than sodium sulphide as the active chemical, with no adverse effects on the quality of the pulp. Nor is there any evidence that the high percentage of polysulphides increases corrosion.

The exact role of polysulphide in the cooking liquor is as yet undetermined, but the fact of its presence without harm to the pulp is fully demonstrated by these experiments. Moreover, since the polysulphide may represent 50 percent or more of the sulphidity of a satisfactory cooking liquor, it must be concluded that polysulphide plays an active part in the pulping process and can satisfactorily replace a large proportion of the sodium sulphide.

The method of addition of the synthetic salt cake to the green liquor dissolver tank, will vary, of course, with plant custom. The required amounts of synthetic salt cake to be added may be readily determined by the routine liquor analysis. A uniform pulp may then be obtained by means of a single control, regulating the proportion of make-up chemical to smelt salts. Satisfactory results have been obtained in continuous feed operations using


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0.261 to 0.321 lb. of synthetic salt cake per gallon of green liquor.

Many operating difficulties are eliminated by this new procedure. Since only black liquor is being introduced into the furnace, its performance becomes more uniform. Other improvements which have been observed are a more fluid smelt, better settling after causticizing, and a clearer white liquor.

The new process also makes it possible to produce regularly a uniform pulp, since it gives the plant operator greatly improved control over operations. The addition of synthetic salt cake to the green liquor, which is easily controlled, makes for uniformity in the white liquor, the black liquor flow, the operation of the furnace, and the composition of the smelt.

Green liquor addition also makes possible sudden increases in the white liquor stock. Large amounts of synthetic salt cake may be added directly to the green liquor without in any way interfering with furnace operation, or affecting the sulphidity of the white liquor, in contrast to the effect of adding large quantities of salt cake to the furnace.

V. Woodside, J. D. MacMahon and G. P. Vincent, Mathieson Alkali Works, before Alkaline Pulping Committee, TAPPI, Savannah, Oct. 19-21, 1944.

DDT TOXICITY

STUDIES conducted at the Industrial Hygiene Research Laboratory of the National Institute of Health in Bethesda, Md. showed that DDT in concentrations up to 10 percent in inert powders, for dusting clothes, as in the extermination of lice, offers no serious health consequences. The use of a 1 percent DDT deobase mist mixture had no toxic effect on rabbits, and it should be safe to use as a fly spray. In a clinical and laboratory study of three men who had had several months of continuous occupational exposure to DDT in its various forms as an insecticide, and evaluation of results failed to indicate any definite toxic effects from exposure to DDT.

Inhalation studies of the toxicity and potential dangers of aerosols, dusting powders and mists containing DDT has been made at the Laboratory on mice, rats, guinea pigs, dogs, monkeys and human beings. These experiments revealed a marked difference in the susceptibility of different animal species to DDT. Mice were more susceptible than rats; guinea pigs and rabbits, with monkeys and dogs, most resistant. Only when relatively large doses were ingested or absorbed through the skin did toxic reactions set in, such as tremors, "jumpiness" as in strychnine poisoning, convulsions with death, fatty degeneration of the liver and kidneys or changes in the nerve structure.

In experiments with dogs, daily insufflation of 100 mg. of pure DDT per kilogram of the weight of the animal caused definite signs of poisoning in only one out of the three animals tested, after a period of 18 days.

Although the study dealt only with the appraisal of the potential dangers of DDT when inhaled as an aerosol, dust, or mist, massive doses either by mouth or by skin absorption will cause toxic reactions.

Heavy contamination of foods should be avoided. Despite the inherent toxicity, the use of DDF in 1 to 5 percent solutions in 10 percent cyclohexanone with 85 to 95 percent Freon, as aerosol, should offer no serious health hazards when used as an insecticide.

Paul A. Neal, Federal Security Agency, before National Museum Entomological Society, Washington, Nov. 2, 1944.

CAUSTIC-CHLORINE CELLS IN AMERICA

There are a few fundamental points in cell construction. Aside from these it is a matter of technical knowledge and intelligent "horse sense" in handling them. Only a comparatively few of the cells tried out have stood the test of time. Since the first patent taken out in the United States 61 years ago, there have been nearly 350 patents on caustic-chlorine cells. Of these, nearly 100 were by foreigners and 98 were on mercury cells. Of all these patents only about 32, less than 10 percent, have been tried out commercially and only 16 have stood the test of time and continue to operate.

As experimental work began in Europe before it started here, it might be expected that a number of foreign cells would have been in use in America, but of the 100 foreign caustic-chlorine patents, only four have been tried out here and only two continue to function.

Many of the cells which have been patented might have succeeded if they had had a fair chance and money to back them, but a far greater number never could have become successful. There were over 40 plants operating before this present war started and the demand for chlorine by the government has caused seven more to be built.

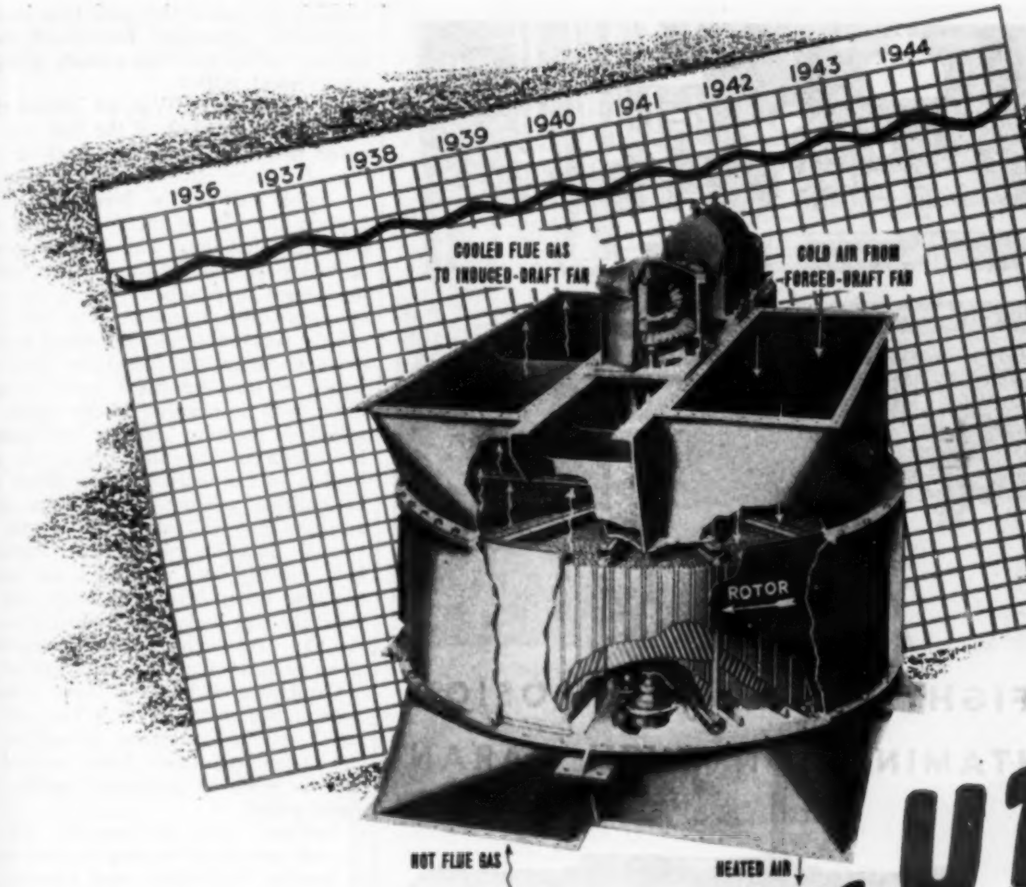
The development of the American electrolytic alkali-chlorine industry covers a period of over 100 years. Numerous difficulties, both chemical and commercial, had to be overcome. Today the industry ranks among the very foremost of the entire electrochemical group. As to the future, there are still problems of cell construction and cell operation that await solution.

L. D. Vorce, Westvaco Chlorine Products Corp., before The Electrochemical Society, Buffalo, Oct. 12-14, 1944.

POSTWAR PAINTS

There has been a tremendous amount of research and development work carried on during the War period which has resulted in many new products and improvements of old products. When the War is over all of these developments will be available for general civilian use.

We can divide the field of coatings into three groups: exterior, interior and special coatings. If we were to ask the average consumer of exterior paints to define the ideal coating, he would say the ideal coating is one that can be easily applied and will protect the surface for the expected life of the structure and retain its original color and appearance. We do not consider the ideal paint is in sight as yet. We are, however, constantly trying to produce exterior paints which will have



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Today, service is quickly available. In most cases a service engineer is sent out the same day we receive your call. To cope further with such abnormal operating conditions, Preheat engineers have developed the new, Single-nozzle Cleaner to remove deposits from preheater surfaces, and the Metal Temperature Control, which prevents the formation of these deposits, and makes possible continuous, full-heat recovery regardless of fuel or load.

ENGINEERING SERVICE – The engineering staff also is prepared to assist you in applying standard or special types of Ljungstrom preheaters to steam generating units, oil refinery heaters, metallurgical furnaces, etc., or to help you and your engineers make better use of low-grade, more abundant fuels.

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a longer life and at the same time keep a presentable appearance throughout their life and fail by very slow erosion, giving a good repaint surface.

Just prior to the War, we learned that controlled penetration of the first coat on either new wood, concrete, brick or old repaint surfaces gave the best foundation for finish coats. The binder or oil is kept in the film of the finish coats and improves durability. This is the principle on which the two-coat paint system, which has gained in popularity during the past few years, was founded. The old type vehicle penetrated into the wood leaving a porous prime coat which, in turn, absorbed oil from the finish coats, giving a finish with insufficient binder which resulted in excessive chalking and general breakdown of the film. New oils and binders of the synthetic type which will be available, will not only have this characteristic but will also have greatly increased durability properties. Pigments have recently been developed and others are now being developed which will reduce chalking and delay disintegration of the film. All of this will be accomplished at no sacrifice of application properties.

Great progress has been made in metal primers and metal paints. The vast research and test programs carried on for the Army and Navy have resulted in greatly improved protective qualities of metal paints.

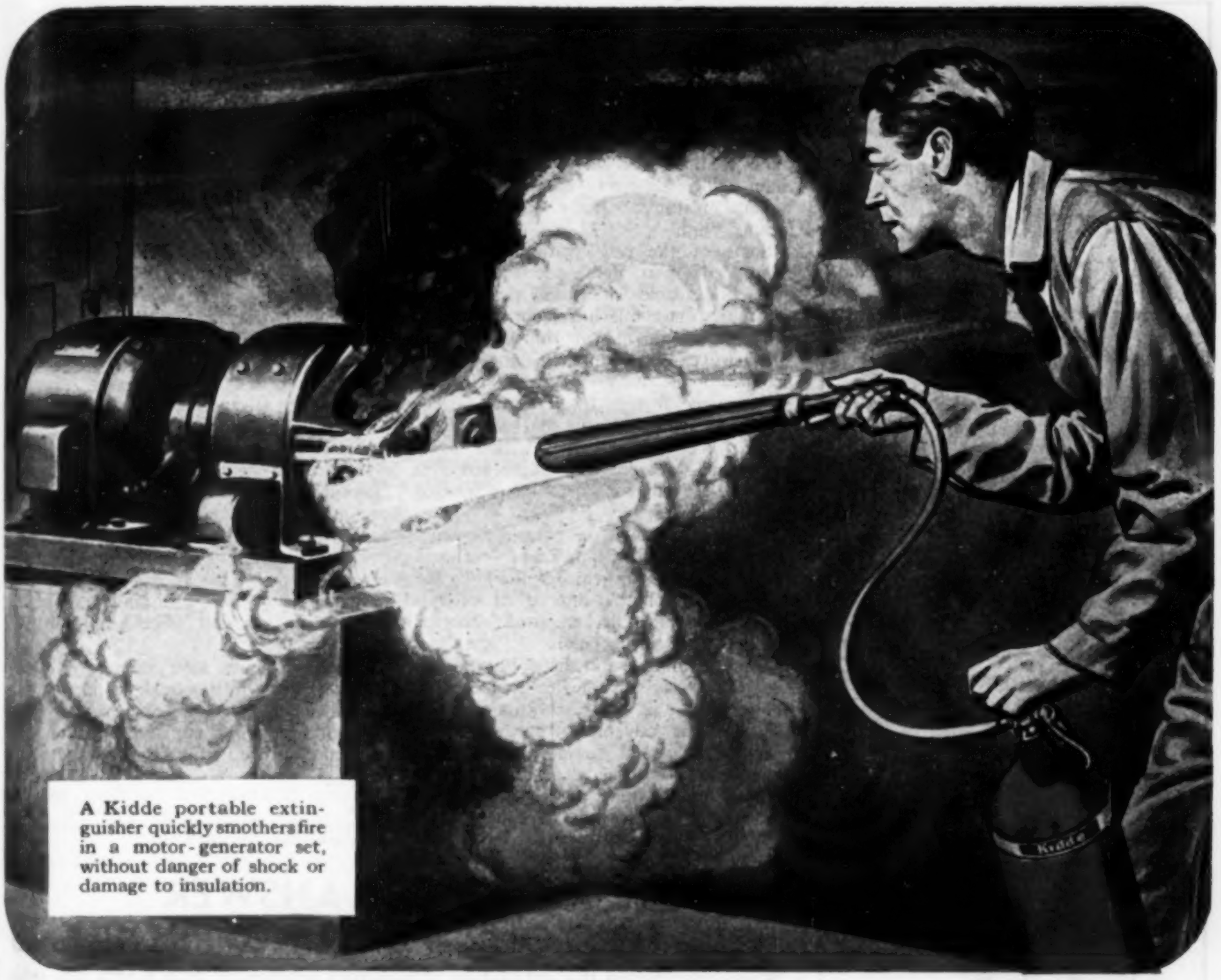
Synthetic resin developments and improved methods of treating oils have made it possible to produce spar varnishes of improved durability and faster drying time.

During the War period a great deal of progress has been made in improving exterior emulsion paints. For use on concrete, stucco and brick surfaces, exterior emulsion paints will be produced which will have good durability and surface characteristics. There is some question as to the advisability of using emulsion paints as the prime coat on wood or ferrous metals, however, it is entirely possible that special materials may be produced which will be thoroughly satisfactory for these uses. Exterior emulsion paints will be available which are superior to those which were available prior to the War. Use of exterior emulsion paints will be rather limited directly after the War but will increase in use as more experience in application and service qualities is obtained.

The new synthetic vehicle developments will give interior finishes with superior service properties. You can expect interior flat finishes that can be applied in one coat over any surface and will give complete hiding and perfect uniformity of appearance.

Perfect gloss finishes can be accomplished in two coats over the most porous surfaces. This will be possible because of the non-penetrating properties of the synthetic vehicles used in the manufacture of these finishes.

Much faster drying properties can be expected. We will have real four-hour enamels. Enamels that you can walk on or sit on in four hours or less. These finishes will have greater resistance to wear, washing and other service condi-



A Kidde portable extinguisher quickly smothers fire in a motor-generator set, without danger of shock or damage to insulation.

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Even a small blaze in electrical equipment — or flammable liquids — may quickly flare into a serious fire...unless the *right* extinguisher gets to work fast.

Ordinary water-type extinguishers cannot stop these tough Class C and Class B fires. But a Kidde portable — approved by both Underwriters' and Factory Mutual Laboratories — chokes them off quickly and safely.

If a blaze breaks out in *electrical equipment,* non-conducting carbon dioxide keeps the operator safe from the danger of shock, while it swirls around corners and penetrates crevices to extinguish every flicker of flame. Dry and inert, the gas does not damage the equipment or rot the insulation.

When *liquids* catch fire, a cloud of carbon dioxide gas from the Kidde nozzle forms a thick blanket that smothers the flames . . . then evaporates to leave valuable materials uncontaminated.

Safe, clean, fast — Kidde extinguishing equipment is ready to take on the job of guarding *every* tough-fire area in your plant. Check the accompanying list of hazardous locations — then ask a Kidde representative to show you how best to protect them.

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tions to which interior finishes will be exposed.

Emulsion-type paints which can be thinned with water have received their share of attention, and remarkable improvements in application and service properties can be expected. Water reducible paints because of their ease of application, minimum odor, relatively fast dry and economical feature, will be an important interior finish.

Some of the new synthetic developments will make floor, porch and deck enamels available which will really stand the rough usage to which floor paints are often subjected, and at the same time, will have excellent durability for use on exterior porch floors and steps. In the past, many manufacturers have carried two lines, one for interior and one for exterior. We feel that the postwar floor, porch and deck enamel will be fast drying and equally satisfactory for interior and exterior use.

Many developments in colored pigments will give durability, alkali and chemical resistance properties which will add to the serviceability of the interior or exterior coating in which they are used, either as solid colors or tinting colors.

Fire retarding paints have been developed to a very high degree to meet the requirements of the Army and Navy. They will be available for general use on wood, textile and composition surfaces. These coatings have good durability as well as fire retarding properties, and can be used for interior and exterior use.

The developments which have been made in synthetic elastomers now being used for various Army and Navy requirements, will make it possible to produce acid, alkali and chemical resisting coatings for industrial and chemical plants where these properties are essential. Good durability will be combined with chemical resistance. Fume-proof enamels will be available which will be far superior to those of the past.

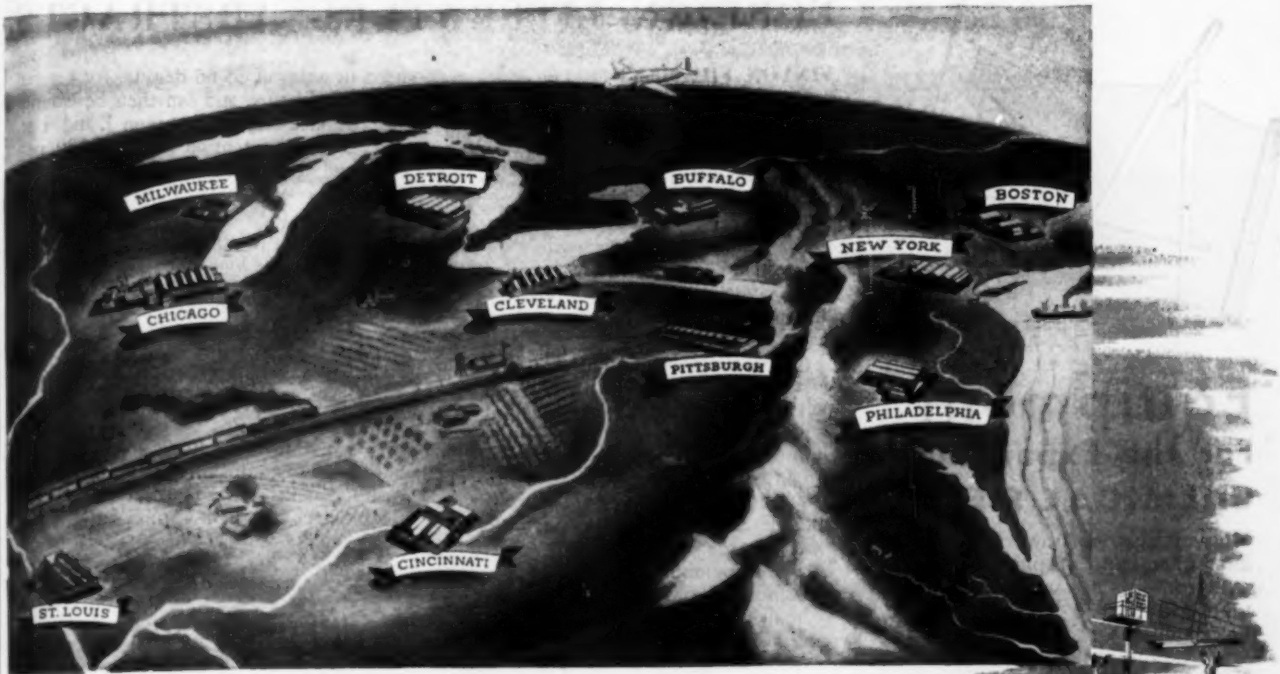
Insecticidal paints will be available to keep the home free from flies, mosquitoes and other insects for probably a year or more. Prolonged tests are now under way. These paints can be made in flat, semi-gloss or gloss and will have all the service qualities of other paints. These paints are not toxic to human beings.

Improved galvanized metal paints will be available which can be used either as one coat or two coat jobs. These paints will have excellent adhesion to new galvanized metal. The durability of one coat of this paint will be superior to the two-coat job of the past.

Recent developments indicate that heat resisting paints of superior quality will be available which will withstand very high temperatures without discoloring, blistering or peeling.

Non-slip paints have been developed for the Navy which should be popular as finishes for floors in industrial plants, public buildings, banks, etc. and may find use as porch and step paints for the home.

Austin D. Allen, Vita-Var Corp., before New Jersey Council of Painting and Decorating Contractors of America, Newark, Jan. 11, 1945.



Ryerson Wartime Steel Service

Prompt Deliveries from 11 Plants

Here's the Ryerson network of eleven plants strategically located to give you prompt, dependable steel-service. Stocks on hand include bars, shapes, structurals, plates, sheets, tubing, etc.—carbon, alloy, Allegheny stainless and tool steel. At present our service cannot always be as fast nor our stocks as complete as under normal conditions. Nevertheless, deliveries on anything from a single piece to several tons are generally satisfactory.

When an item is not in stock at our nearest plant it usually can be shipped from one of our other plants. Very often this plant-to-plant check enables us to give unusual service in meeting your emergency steel requirements for new equipment maintenance and repair.

Our latest stock list describes our complete line—more than 10,000 kinds, shapes and sizes of steel. This buying reference is a veritable "book of knowledge". It gives descriptions, sizes, weights, specifications and cutting extras for every kind of steel. Our nearest plant will be glad to furnish you a copy.

RYERSON CERTIFIED STEELS

JOSEPH T. RYERSON & SON, Inc., Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL

FOREIGN LITERATURE ABSTRACTS

VINYON FILAMENT

VINYL acetate is the second polymer used for Vinyon and its properties are different from those of vinyl chloride. It softens at a rather low temperature and its mechanical resistance cannot be compared to that of vinyl chloride, but it can be used as glue. Vinyl acetate is colorless, odorless and tasteless, it is harmless, thermoplastic, is not attacked by water, aliphatic hydrocarbons, higher alcohols, etc., and remains very stable to light.

A mixture of vinyl chloride and acetate does not produce any useful resin but polymerization gives an extremely useful product which is suitable for numerous industrial applications, depending on the proportions of the mixture. Mixtures which contain less than 85 percent vinyl chloride are rarely used. The content of vinyl chloride in the mixed polymer is increased depending on the conditions of resistance and viscosity of the product.

In manufacture of Vinyon filament the mixed crude polymer is taken in the form of a white power which is dispersed in acetone. After filtration and elimination of air it is spun dry in the same way as cellulose acetate. The filament is immediately made moist again so that it retains a little static electricity. Six twists are given per inch, then the filament is stretched by more than 100 percent of its initial length. As in the case of nylon, the stretching is important for rupture and stability. The stretched filament is then fixed in water at 65-66 deg. C. for a given number of hours, and can then be wound.

Resistance can vary between 1 and 4 gr. den., and the extension between 120 percent and 18 percent, depending on the working conditions. Less extensibility corresponds to higher resistance and vice versa.

Since Vinyon filament is very repellant to water, the extensibility and resistance are identical in the dry and the moist states. Vinyon filament is thermoplastic at 66 deg. C., and it is necessary to do the work in a very humid atmosphere. Vinyon is not attacked by bacteria or spores. It is a poor conductor of electricity and is very resistant to acids and alkalis. It can be dyed by coloring the spinning solution with pigments or by treatment with oil-soluble dyes in a hydrocarbon bath.

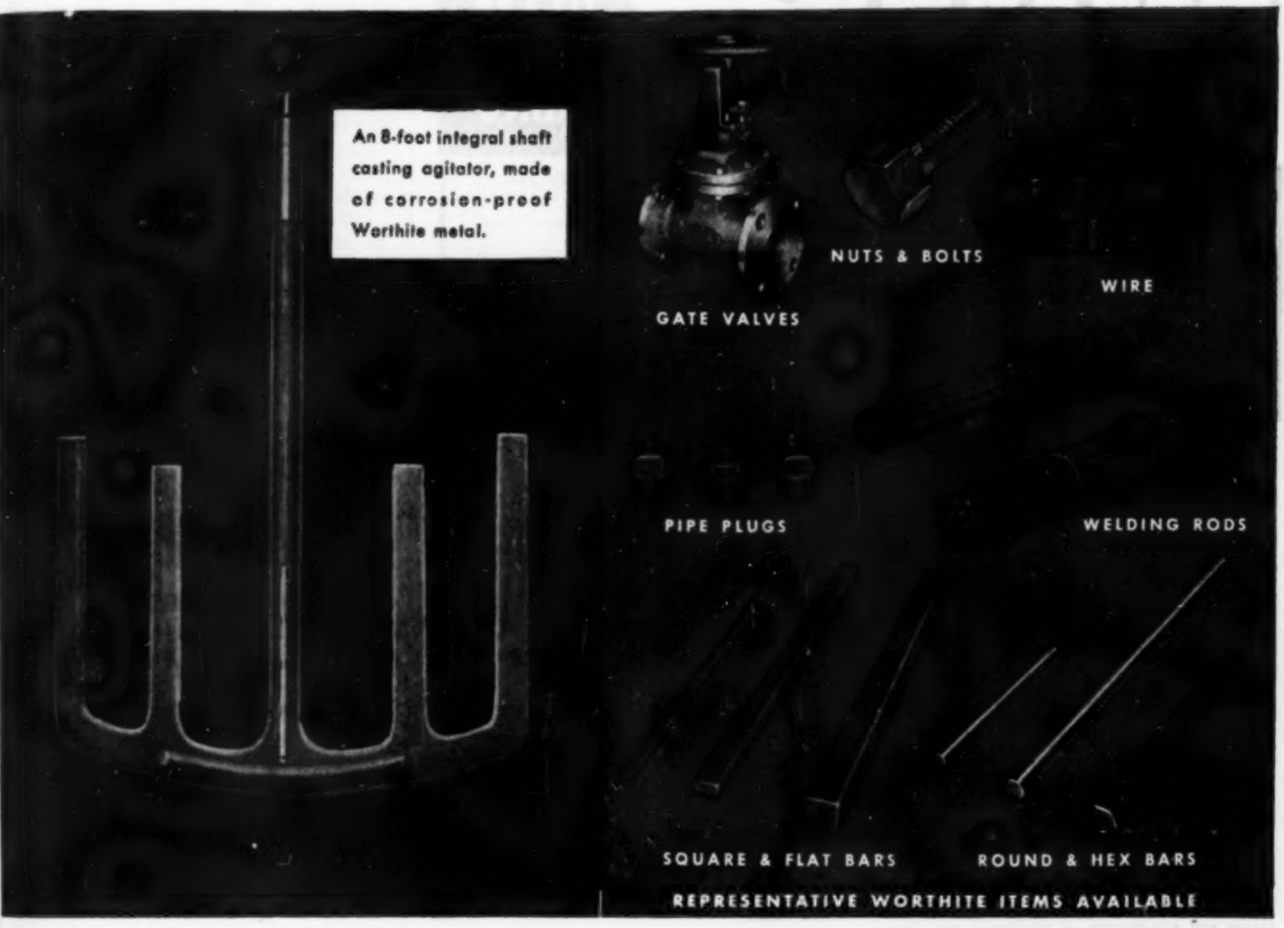
Digest from "Manufacture of Vinyon Filament" by T. M., *L'Ind. Text.* **60**, 159, 1943. (Published in France.)

LUBRICATION OF STEAM TURBINES

DEVELOPMENT of steam turbine construction in recent years has been characterized by a continuous increase in the temperature and pressure of the steam used so that temperatures of 500–525 deg. C. and pressures of 100–150 atm. are now not uncommon. This progress has been made possible not only by superior construction but also by developments in lubrication. Perfect lubrication of a ma-

CORROSION PROBLEMS?

Try Worthite Super-Stainless



CORROSION RESISTANCE. ACIDS: Acetic, Chromic, Citric, Fatty, Formic Hydrochloric (Cold dilute), Nitric, Phosphoric, Sulphuric, Sulphurous.

SALTS: Acid and alkaline solutions.

FRUIT JUICES: All kinds.

FOOD PRODUCTS: All kinds.

ALKALIES: Potassium Hydroxide, Sodium Hydroxide, Black Liquor, Sulfides, Brines, Lime, Bleach, etc.

References: Worthington Bulletin W-350-B4B. Chemical & Metallurgical Eng. Materials of Const. Sept. 1944. Reprints of recent papers and articles on special applications sent on request.

ABRASION RESISTANCE. Exceptionally good in handling most salt crystals and fine abrasive solids carried in suspension as slurries on filter pressing and transfer service.

Typical slurries handled in Worthite Centrifugal Pumps: Aluminum Sulfate, Ammonium Nitrate, Ammonium Sulfate, Black Liquor and Salt Cake, Brines, Electrolytic Tank House Slimes, Ferrous Sulfate, Glaubers Salt, Lime Slurry, Milk of Lime, Phosphates, Pigments, Rouge and Emery, Potassium Chloride, Sodium Chloride, Sugar.

Reference: Worthington Bulletin W-350-B6.

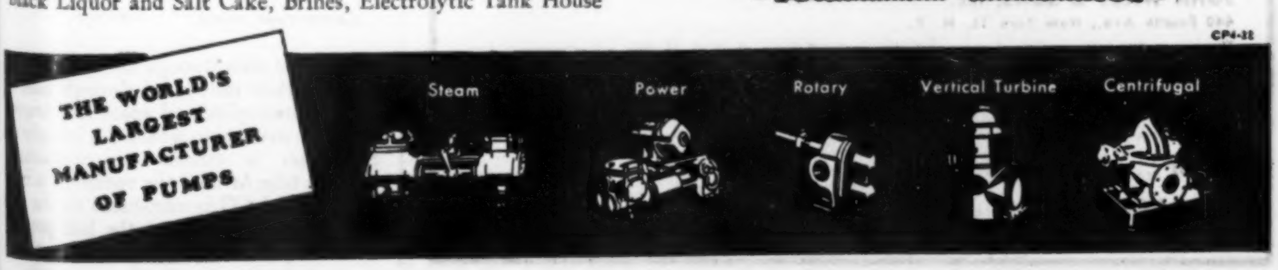
PHYSICAL PROPERTIES. Strong, Ductile, Tough, Machinable—Repairs by Welding and Metallizing.

Reference: Worthington Bulletin W-350-B4B.

Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.

WORTH *BEHIND THE NAME*
WORTHINGTON

CP4-32



chine depends on use of a minimum quantity of lubricating oil.

Economy of turbine operation depends to some extent on over-all cost of the lubricating oil, which in turn depends on the following factors: (1) Cost of lubricating oil; (2) expense of repairing due to defective lubrication; (3) cost of eventual shutdowns and resulting loss of production; (4) expense of maintenance and decrease in the life of the machine due to defective lubrication; (5) amortization and depreciation from excessive wear and defects in the turbines produced by poor lubrication; (6) expense of cleaning and regulating the lubrication system.

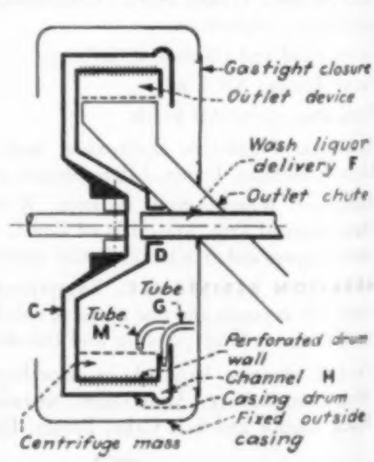
Safety and economy of operation can be attained by perfect lubrication with minor expenditure on lubrication. Influencing factors are as follows: (1) Quality of the lubricating oil and the proper selection of this oil; (2) proper construction of the lubricating and regulating system; (3) technical control of the lubrication during operation of the turbines; (4) care and treatment to which the oil is submitted during the process of lubrication; (5) economy of the lubricating oil in the turbine station.

Digest from "Lubrication of Steam Turbines" by K. Wolf, *Oel und Kohle* 40, 121, 1944. (Published in Germany.)

NEW TYPE CENTRIFUGE

A NEW type centrifuge is shown in the attached sketch which consists of two cylinders, the inner one perforated and the outer one not, placed concentrically and coaxially. The axis and the cylinders have the same center of gravity as the rotating mass so that there are no vibrations even when the number of revolutions is very high.

A particularly interesting application of this centrifuge is for the extraction of fatty materials. The product to be centrifuged throws off a large proportion of the fat by simple rotation, and then goes thru the perforated bottom and accumulates between the two cylinders *C* and *D*, going



into *H* and then through *G*. The extractor liquid is then introduced through tube F, fills the intercylindrical space and impregnates the material to which it is introduced. Separation is carried on continuously through tube *M* until the operation is completed. Tube G is introduced to the bottom and used to extract the last portions of the liquid. Although the operation is

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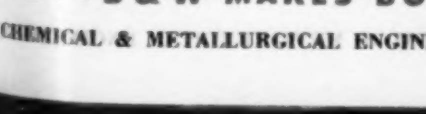
THE BABCOCK & WILCOX TUBE COMPANY

Seamless Tube Division, Beaver Falls, Pa. — Welded Tube Division, Alliance, Ohio



B & W MAKES BOTH

TA-1300

carried out without compressing the material thus extracted, the work proceeds quickly, the cakes do not crack and the washing is perfect.

Since the apparatus is completely closed during operation there is no chance of loss of extractor liquid by volatilization. The residues which remain from the extraction can be removed with steam.

This particular model has been employed in practice for the activation of catalysts by means of acids and also for preparation of nitrocellulose. In the latter case there is the unquestionable advantage of not condensing the cellulose while the operation of stabilization (washing and boiling) of the gun-cotton obtained can be accomplished in the same apparatus.

Digest from "New Type of Centrifuge" by Van Riel, *Die Chem. Techn.* **16**, 113, 1943. (Published in Germany.)

THE FAT INDUSTRY

World consumption of fats has reached the figure of 25.8 million tons, 11.2 of which are vegetable fats and 14.6 animal fats. The animal fats can be further broken down as follows:

Milk fats	8.3 million tons
Pork fats	3.5
Oxen fats	1.8
Sheep & goat fats ..	0.5
Whale fats	0.5

If the quantity consumed for certain industrial purposes is taken into consideration, then this production will be 22 million tons, which corresponds to some 10 kg. per person for the whole world.

A classification is given of practically all the raw materials used in this industry, even including such rare materials as the wood of the linden tree. Various methods of industrial processing are also given and there is detailed and extensive information on the whale oil industry, manufacture of margarine and some material on the hydrogenation of fats.

Digest from "Evolution of the Industry of Fatty Materials" by G. Ray, *Chim. & Ind.* **49**, 232, 1943. (Published in France.)

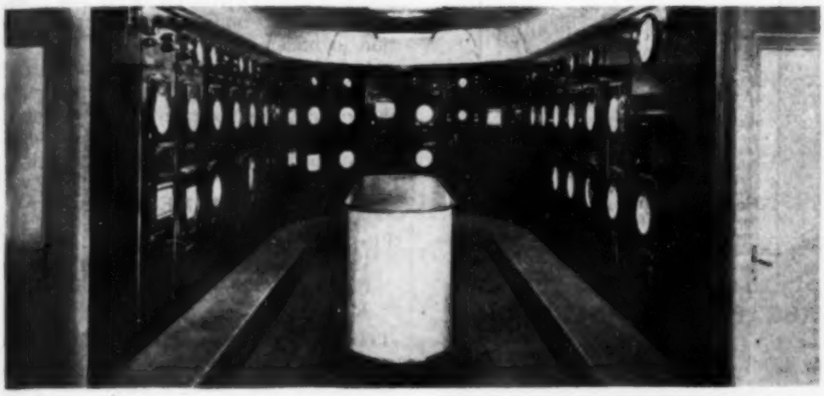
ORGANIC MICROANALYSIS

Simultaneous microchemical determination of carbon, hydrogen, halogens and sulphur was made on a 5-mg. sample of an organic substance. Decomposition with oxygen was carried out by Dennstadt's method. The microdetermination of the carbon and hydrogen was made by weighing the water and carbon dioxide which collected in the absorption apparatus. Microdetermination of the halogens and sulphur was made by determining the halides and sulphate of silver fixed on films of silver. After the silver salts were dissolved in ammonia, they were precipitated with a given excess of potassium iodide and this excess determined iodometrically. The precision for chlorine is 20 γ, for bromine 50 γ, and for sulphur 30 γ, taking into account the fact that there is a progressive dilution of the solution being determined. A blank test was made at the same time.

Digest from "Contribution to Quantitative Organic Microanalysis. General Micromethod for Simultaneous Determination of Carbon, Hydrogen, Halogens and Sulfur" by M. Lacourt and Ch. Chang. *Bull. Soc. Chim. Belgique* **135**, 50, 1941. (Published in Belgium.)

CHEMICAL ENGINEER'S BOOKSHELF

LESTER B. POPE, Assistant Editor



Control engineering at the Everett, Mass., refinery of the Colonial Beacon Oil Co.

BASIC MATERIAL

AUTOMATIC CONTROL ENGINEERING. *By Ed Sinclair Smith. Published by McGraw-Hill Book Co., New York, N. Y. 367 pages. Price $4.*

Reviewed by W. B. Heinz

AUTOMATIC control mechanisms and applications can best be engineered by the use of analytical methods which are little used by most engineers. Contrary to prevailing opinion, many of these "advanced" methods can actually be used advantageously by men to whom they are now unfamiliar. After a serious, although relatively brief study of fundamental theories and methods any technically thoughtful engineer can possess a working understanding of control phenomena and practical methods for analyzing them. It is not necessary for a "non-mathematical" engineer to restrict himself to self-created reasoning processes in dealing with his control problems. He can, if he chooses, apply expert methods sufficiently well to come out with a net gain by undertaking to do so.

Such is the thesis upon which Mr. Smith has based his book. It was his intention to arrange in one small volume all the basic material relating to control, its underlying sciences and mathematics, which is needed for effective automatic control engineering. The book meets its design specification, but it would be easier to assimilate had its contents been expanded into greater volume.

More than half the book is classified as Appendix. Many authors would have entered most of that "Appendix" material into the main text, where it could as logically have been placed. For example, Appendix B gives an excellent simplification and arrangement of orifice flow calculations as part of its section on hydraulic principles. Its corresponding sections on electricity and electronics afford ready reference to fundamental principles and facts which control engineers need to use. Its reviews of transients and advanced mathematical methods are decidedly apropos, as are also its elaborate bibliography and its review of the patent art.

Readers will criticize Mr. Smith's book principally because it has been aimed at so wide a range of people that none may be entirely pleased. After effective use of the book, however, this reader is convinced that review space devoted to criticism would benefit nobody. The book is clearly worth the price of admission as it stands.

PHYSICAL ORGANIC CHEMISTRY

THE THEORY OF RESONANCE AND ITS APPLICATION TO ORGANIC CHEMISTRY. *By George Willard Wheland. Published by John Wiley & Sons, New York, N. Y. 316 pages. Price $4.50.*

Reviewed by F. C. Nachod

LONG gone are the days when an ambitious young organic chemist would set out to synthesize quinine and by oxidation of aniline would finish up with a brand-new mauve dyestuff. Those were days of spectacular discoveries; today, a great deal of our effort is concerned with classifying, systematizing and re-canvassing the vast amount of information which has been gathered by preparative chemistry. Wheland's treatise on resonance is such a book.

A fellow reviewer recently remarked on these pages that some texts are "useful but dull." Dr. Wheland's text is immensely useful and far from dull; your reviewer believes that it is a brilliant and inspiring little book.

The author sets out with a discussion of resonance, then devotes chapters to the nature of valence, resonance energy, and steric effects. Chapters V to VIII deal with resonance in relation to dipole moments, molecular spectra, chemical equilibria, and chemical reactions. A nine page appendix in which values of interatomic distances are compiled, and author and subject indexes conclude the book.

Subject matter is well organized and well presented. The text has been carefully prepared and only one typographical error was noted. The book will undoubtedly find a large audience, by no means restricted to organic and physical chemists, and it should be required reading for anyone teaching an advanced course in physical organic chemistry and for the research worker in the field.

ANALYTICAL REFERENCE

COMMERCIAL METHODS OF ANALYSIS. *By Foster Dee Snell and Frank M. Biffen. Published by McGraw-Hill Book Co., New York, N. Y. 753 pages. Price $6.*

INDUSTRIAL analysists, when called upon for other than routine control work, now have a new tool in this product from the Snell Laboratories. There are available many references and texts dealing with theoretical qualitative and quantitative analysis, but for practical work on commercial products the number is small. Griffin's "Technical Methods of Analysis" has been a standard but is now quite old. Advent of modern plastic, colloidal and emulsion materials has necessitated new methods and new refinements of old methods of analysis. These, in addition to standard procedures, are what Snell and Biffen offer in their new book.

It contains 39 chapters the first four of which are concerned with apparatus and preliminaries to the analysis. The fifth is devoted to microanalysis and spot testing; the sixth to hydrogen ion determination; and the last to indicator, reagent and volumetric solutions. In between is the real meat. Chapters deal with the techniques of analysis of a multitude of materials: metals, chemicals, fuels, oils, paints, fibers, and many other industrially important substances. In each case directions are clear and follow logical sequence from preliminary steps to final calculations.

VAPOR CHARTS

THERMODYNAMIC CHARTS. *Second edition. By Frank O. Ellenwood and Charles O. Mackey. Published by John Wiley & Sons, New York, N. Y. 46 pages. Price $2.75.*

THIRTY-TWO 8x11-in. pages of charts are presented in this second edition. Twenty-one are for steam; there is one for low-quality steam, two each for freon 12 and

RECENT BOOKS RECEIVED

Commercial Waxes, Natural and Synthetic. By H. Bennett. Chemical. $11.

Formaldehyde. By H. Frederic Walker. Reinhold. $5.50.

water and three for ammonia. The remaining pages include examples of use of charts, three psychrometric charts, and tables of logs, squares of numbers, barometric conversions and jet velocities from ideal nozzles.

Revision, in addition to allowing corrections, has enabled the authors to include the new chart on steam and water mixtures having qualities less than 80 percent—useful for such problems as flow of wet mixtures through orifices, valves and pipes, blow-off from boilers and water circulation in boilers.

Calculated on a cost per page basis, this book at nearly six cents per page, is one of our most expensive. But engineers needing and using the charts will find them worth much more than 6c. each.

MATERIALS AND METHODS

Plastic Molding and Plant Management. *By D. A. Dearle. Published by Chemical Publishing Co., Brooklyn, N. Y. 196 pages. Price $3.50.*

Techniques of compression and injection molding, construction and care of molds, production and plant management problems are the primary concern of this small guide. There are brief descriptions of the manufacture, properties and uses of the thermosetting and thermoplastic materials. Although written primarily for the molder, the book can be of value to producers of plastics by giving better understanding of molding requirements and problems.

RECENT BOOKS & PAMPHLETS

Vapor Transmission Analysis of Structural Insulating Board. By F. B. Rowley and C. E. Lund. Bulletin No. 22, Engineering Experiment Station, University of Minnesota, Minneapolis. 71 pages. Price 40 cents. Results of the first part of a research program purpose of which was to study vapor permeability properties of structural insulating board and of walls and structures in which these boards are often used. Also various types of paint and surface finish used to reduce vapor permeability.

Strengthening the Congress. By Robert Heller. Published by National Planning Association, 800-21st St. N.W., Washington 6, D. C. A report setting forth 14 recommendations which constitute an integrated program for strengthening Congress.

Report of Tests on Control of Magnesium Fires With Sprinklers. Issued jointly by Factory Insurance Association, Hartford, and National Board of Fire Underwriters, New York. 45 pages. Tests made to determine value and effectiveness of automatic sprinkler protection in controlling fires involving magnesium.

Excess Profits Tax Relief: The Cyclical Provisions. By J. L. Snider. Business Research Studies No. 33, Harvard Business School, Boston 63, Mass. 30 pages. Price $1.50. A study undertaken in an effort to contribute something with regard to the problem of administering the cyclical provisions for excess profits tax relief (Section 722 of the Internal Revenue Code).

H-O-H Water Studies. Published by D. W. Haering & Co., Chicago, Ill. 52 pages. A collection of articles on the control of corrosion, scale and algae.

Petroleum Products. Published by American Petroleum Institute, 50 W. 50th St., New York 20, N. Y. 8 pages. Price 10 cents. Uses of petroleum and the operations and processes between oil field and consumer.

Paper and Paperboard. Published by American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa. 108 pages. Price $1.50. Characteristics, nomenclature and significance of tests.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publication noted in this list always give the complete title and the issuing office. Remittance should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper covers unless otherwise specified. When no price is indicated, the pamphlet is free and should be ordered from the Bureau responsible for its issue.

Heat-Stabilized Compressed Wood (Staypak). By R. M. Seborg, M. A. Millett, and A. J. Stamm. Forest Products Laboratory, Madison, Wisconsin. No. 1580. Mimeographed. Revised December 1944.

Solid Carbon Dioxide (Dry Ice). Bureau of Standards. Letter Circular LC-763. Mimeographed.

The Care of Floors. Bureau of Standards. Letter Circular LC-764. Mimeographed.

Double Superphosphate. By A. L. Mehring. Department of Agriculture. Circular No. 718. Price 10 cents.

A Digest of the Literature on DDT Through April 30, 1944. By R. C. Roark and N. E. McIndoo. Bureau of Entomology and Plant Quarantine. E-631. Mimeographed.

List of Bulletins of the Agricultural Experiment Stations for the Calendar Years 1941 and 1942. By Helen V. Barnes. Department of Agriculture. Bibliographical Bulletin No. 4. Price 15 cents.

Dairy and Poultry Market Statistics 1943. War Food Administration. Mimeographed.

Pottery Tableware. U. S. Tariff Commission. War Changes in Industry Series Report No. 7. Mimeographed.

Buyer's Guide for Surplus Property. Surplus War Property Administration. Price 10 cents. Revised.

Statistics of Higher Education 1939-40 and 1941-42. By Henry G. Badger, Frederick J. Kelly and Lloyd E. Blauch. Office of Education. Price 45 cents.

Vocational-Technical Training for Industrial Occupations. Office of Education. Vocational-Technical Training Series No. 1. Price 40 cents.

Problems of Mobilization and Reconversion. First Report by The Director of War Mobilization and Reconversion. Office of Mobilization and Reconversion.

Quality of Surface Waters of the United States 1942. By W. D. Collins and S. K. Love. Geological Survey Water-Supply Paper 950. Price 15 cents.

Reconnaissance of Porcupine Valley, Alaska. By Gerald Fitzgerald. Geological Survey Bulletin 933-D. Price 45 cents.

Phosphate Deposits of the Teton Basin Area Idaho and Wyoming. By Louis S. Gardner. Geological Survey Bulletin 944-A. Price 15 cents.

Procedure for Testing Diesel Mine Locomotives for Permissibility and Recommendations on the Use of Diesel Locomotives Underground. Bureau of Mines. Schedule 22. Price 10 cents.

Diatomites of the Pacific Northwest as Filter Aids. By K. G. Skinner and others. Bureau of Mines. Bulletin 460. Price 25 cents.

Bureau of Mines Exploration of Mercury Deposits to June 30, 1944. By McHenry Mosier. Bureau of Mines. Information Circular I.C. 7299. Mimeographed.

Milling and Smelting Operations of the Magma Copper Co., Superior, Arizona. By Edward J. Caldwell. Bureau of Mines. Information Circular I.C. 7300. Mimeographed.

Moose Creek District of Matanuska Coal Fields, Alaska. By G. A. Apell. Bureau of

Mines. Report of Investigations R.I. 3784. Mimeographed.

Spot Test for the Separation of Aluminum Bronze from Manganese Bronze. By R. B. Corbett. Bureau of Mines. Report of Investigations R.I. 3786. Mimeographed.

Prevention of Benzene-Air Explosions by Addition of Nitrogen and Carbon Dioxide. By G. W. Jones. Bureau of Mines. Report of Investigations R.I. 3787. Mimeographed.

An Outline for Making Surveys. Bureau of Foreign and Domestic Commerce. Economic Series No. 34. Price 10 cents.

Carbonizing Properties of Western Region Interior Province Coals and Certain Blends of These Coals. By J. D. Davis and others. 20 cents.

Discussion of the National Electrical Safety Code. Bureau of Standards Handbook H39. Price 75 cents. Cloth bound.

Preliminary Mineral Statistics. Already released are most of the preliminary metal statistics such as gold, silver, copper, etc., and a few of the scarcer metals such as molybdenum, mercury, tungsten, and numerous non-metallic minerals.

State Mineral Reports. Preliminary mineral statistics have also been issued for most of the important mining states. There are about a dozen of these Eastern states separately covered by items in the MMS series. Central States and Eastern States are covered by two group reports. These preliminary figures, are, however, limited to statements about mine production. They give little or nothing about metallurgical and consumption activities. Individual items can be had on request to the U. S. Bureau of Mines, Washington, D. C.

Agricultural Bibliographies. A summary of publications issued during the last twelve months. Each of the bureaus have issued a mimeographed list of the items published by its staff either through government channels or private periodicals. Copies of these can be obtained fom the individual bureaus.

Latin American Trade. Reviews of trade problems of the United States in dealing with Latin American nations. The U. S. Tariff Commission is issuing four series of small mimeographed reports which deal with country by country with the following general subjects: Economic Controls and Commercial Policy; Mining and Manufacturing Industries; Agricultural, Pastoral, and Forest Industries; Recent Developments in Foreign Trade. Copies of individual reports are available on specific request to the Commission, but that agency is not maintaining general mailing lists to supply all of this material. Inquiries must, therefore, be rather definite as to country of interest or subject of importance.

Latin Dairy Industries. Bureau of Dairy Industry has prepared a series of brief mimeographed reports on the dairy industry of the principal Latin American countries.

Technological Trends and National Policy. National Resources Committee. Price $1. A general resume report discussing social implications of new inventions. Again available at the Superintendent of Documents.

United States Government Salary Tables Semimonthly—48 Hour Week. General Accounting Office. Price 40 cents. An elaborate set of tables showing manner of making deductions according to base summary and other factors. Of possible interest ot those having comparable pay-roll problems in industry.

Containers, A Statistical Handbook. By Edward R. Killam and Catherine C. Gartland. Bureau of Foreign and Domestic Commerce. Industrial Series No. 13. Mimeographed.

Future Problems of the Nation's Critical and Strategic Minerals and Metals Industry. Senate Subcommittee on Mining and Mineral Industry. Print No. 7.

Annual Report. Food and Drug Administration. Price 15 cents.

Annual Report of the Tennessee Valley Authority 1944. Tennessee Valley Authority. Price 25 cents.

Handbook of Standards for Describing Surplus Property. Surplus War Property Administration. Price 10 cents.

Federal Specifications. New or revised specifications which make up Federal Standard Stock Catalog have been issued on the following items: Calcium-Carbide, O-C-101. Zinc Yellow (Zinc Chromate); Dry (Paint Pigment), TT-Z-415. Copper-Phthalocyanine-Blue; Dry (Paint Pigment), TT-C-610. Paint; Ready-Mixed Black TT-P-61a. Clay; Fire, Ground, HH-C-451b. Price 5 cents each.

MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterheads.

Ammonia. The Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. —16-page pocket-sized brochure on anhydrous ammonia, giving physical and chemical data, density, grades and industrial uses, and information on handling and storage equipment.

Batteries. B. F. Goodrich Co., Industrial Products Div., Akron, Ohio—6-page section on recently introduced rechargeable wet storage battery for flashlights. Development of this battery, built on same principle as the automobile storage battery, is outlined. Text and illustrations cover charging units sold in connection with battery. Catalog Section No. 12030.

Bearing Maintenance. Engineering Committee, Anti-Friction Bearing Manufacturers Assoc., Inc., 60 East 42nd St., New York 17, N. Y.—20-page booklet entitled, "Anti-Friction Bearing Maintenance," written for the purpose of answering the demand for conservation of bearings and to assist maintenance men to accomplish this. Includes simplified explanation of bearings, and of "do's" and "don't's." Profusely illustrated. Bulletin No. AFBMA-100.

Belting. Graton & Knight Co. (Merchandising Dept.), 356 Franklin St., Worcester 4, Mass.—56-page manual discussing leather belting for power transmission. Covers hide selection, types of leather, link belting, lacing, etc. 12 full-page tables included for selection aid. Illustrated.

Brazing. Handy & Harman, 82 Fulton St., New York 7, N. Y.—Article entitled, "Low Temperature Silver Brazing Used in Making Chemical Mortar Shell," by Col. H. R. Lebkicher of the Chemical Warfare Service. Discusses conditions and proper treatment for brazing with silver alloys, with special reference to the 4.2 chemical mortar shell now being used by armed forces. Operating methods, chemical cleaning and fluxing covered, and also outlined cycle of operations.

Copper Base Alloys. Bridgeport Brass Co., Bridgeport 2, Conn.—80-page revised Duronze manual, containing specifications and technical data on five copper-base engineering alloys. Discussed and illustrated are examples of product improvement through the use of Duronze. Various graphs show cold drawing characteristics, annealing characteristics, etc.

Chemicals. Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.—1945 edition of "Chemicals by Glyco," describing this company's line of esters, synthetic waxes, emulsifying agents and a number of additional items.

Feed Tanks. Elliott Co., Jeanette, Pa.—30-page ring-bound instruction manual on deaerating feed tanks, operating and maintenance procedure for engine room personnel. Includes purpose, description, construction, operation and maintenance data on feed tanks. Several fold-out pages illustrate the tanks, their diagrammatic arrangements, and methods of operation. Exhaustive description of parts. Booklet is designed to give an operator a general idea of any deaerating feed tank repair job before undertaking it. Instruction Manual NH-500.

Filters. Oliver United Filters, Inc., 33 West 42nd St., New York 18, N. Y.—12-page booklet telling about this company's precoat method of filtration, its principles and advantages. Includes data on Oliver dewaxing filters, Sweetland and Kelly pressure filters. Illustrated Bulletin No. 405-R.

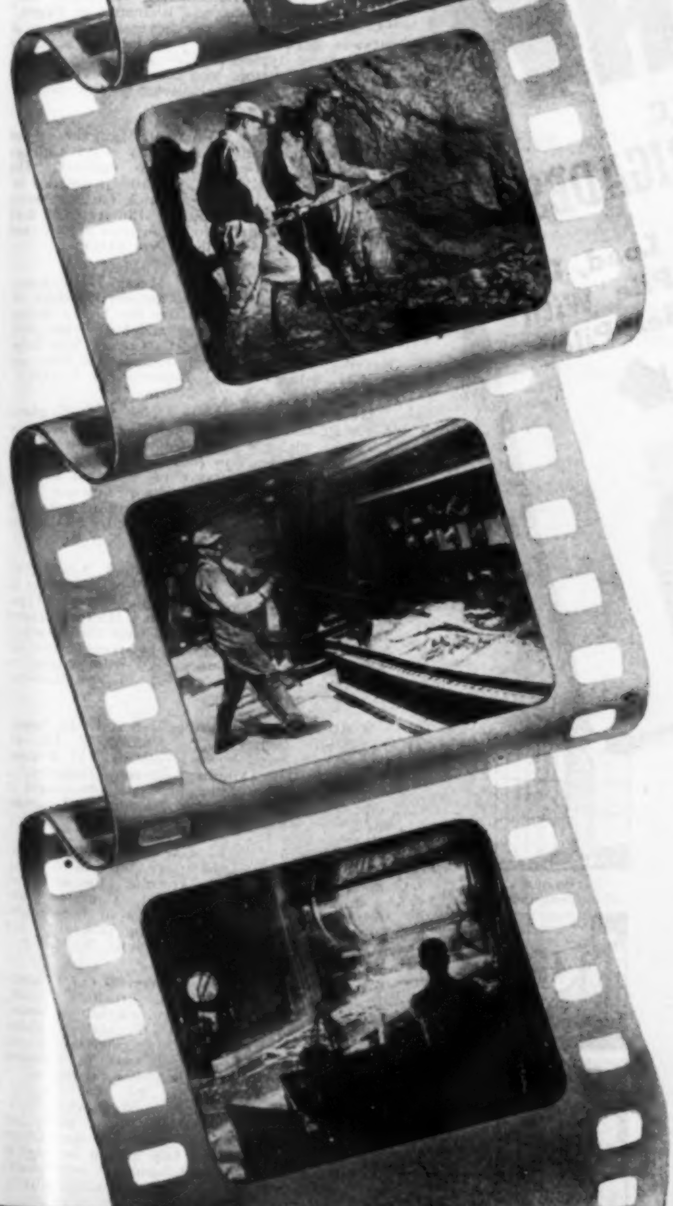
Solids Level Indicator. Fuller Co., Catasauqua, Pa.—4-page folder illustrating and describing the Fuller material-level indicator and its safety switch. Diagrams show typical applications, dimensions and construction of each. Bulletin No. I-2.

Industrial Timer. Paragon Electric Co., 37 West Van Buren St., Chicago 5, Ill.—4-page folder on this company's timers, listing eight

YOU will want to

See this Film...

the dramatic story of ALUMINUM



HERE is a 34-minute educational film on aluminum that is jam-packed with interesting information on its processing . . . from the mining of bauxite, refining it to alumina, reducing the oxide to metal . . . right on through to the rolling of sheet, rod and bar . . . and the manufacture of fabricated parts.

This film, titled "A Recital of Faith," portrays the great advances in aluminum technology during the war years, and the infinite possibilities for aluminum in the post-war world.

Underlined is the part Reynolds Metals is prepared to play in co-operation with engineers and manufacturers who are now using, or plan to use aluminum, and the new lightweight, high-strength aluminum alloys.

Showings easily arranged

Every audience that has seen "A Recital or Faith" has praised it in glowing terms. It is now available, without charge, for showings before technical groups, engineering societies and manufacturers . . . 35 mm. or 16 mm.

For full information, just write Reynolds Metals Company, Aluminum Division, 2500 South Third St., Louisville 1, Ky. On your letterhead, please.

REYNOLDS METALS

REYNOLDS

The Great New Source of ALUMINUM

improvements in engineering features. Tells method of operation, gives data on timing mechanism switch, etc. Illustrated. Price list. Bulletin No. 4492.

Inert Gas. The Davidson Chemical Corp., Process Div., Baltimore 3, Md.—12-page manual on inert gas for blanketing, purging and processes. Tells uses of inert gas, and method of generation. Davidson inert gas generator, its installation and applications are explained. Four full-page schematic drawings show application of inert gas to solvent dewaxing process, use of inert gas for sealing purposes in a Thermofor catalytic cracking unit, method of applying to paint and varnish manufacture and tar acid naphthalene plant. Unit Process Bulletin No. 301.

Lubrication. Shell Oil Co., Inc., 50 West 50th St., New York 20, N. Y.—40-page full-color booklet entitled, "Panorama of Lubrication," laying a basis for solution of lubrication problems which have developed in the wake of aircraft engine advancements. Contains carefully written sections on "Elements of Flight," "Aviation Engines," etc. Several full pages of cutaway drawings show pressure and scavenge oil flow in typical radial air-cooled engines. Original illustrations and excellent non-technical presentation of text characterize this booklet. Vol. 1, No. 8.

Manganese Steel. American Manganese Steel Div. of American Brake Shoe Co., Chicago Heights, Ill.—55-page brochure entitled, "The Toughest Steel Known," containing detailed information on purposes, properties, etc., of Amsco manganese steel. Profusely illustrated. Well laid out. Individual articles on uses of this steel by varied authors. Bulletin No. 844D.

Metal Hose. Chicago Metal Hose Corp., Maywood, Ill.—12-page pocket-sized booklet entitled, "Flexible Metal Hose for Every Industrial Use." Basic coupling and hose types illustrated with descriptive text. Covers Rex-Tube, Rex-Weld, Avioflex, Cellu-Lined, Rex-Flex and C.M.H. bellows types. Bulletin No. E-144.

Meters. Cochrane Corp., 17th and Allegheny Ave., Philadelphia 32, Pa.—8-page bulletin on Cochrane tilting U-tube mechanical flow meters, which accomplish flow measurement by response to differences in pressure on the two sides of mercury-sealed U-tube, employing torsion tubes as a means of eliminating the stuffing box problem. Lists advantages. Illustrated. Publication No. 3010-31.

Mobile Crane. Silent Hoist & Crane Co., Brooklyn 2, N. Y.—24-page full-color booklet on Krane-Kar mobile swing-boom cranes. Types are fully illustrated in action. Many blueprint drawings show capacities and path and length of boom swings, also general arrangement for models, with propelling drive from engine to traction wheels. 2-page list of specifications. Catalog No. 58.

V-Belt Drives. Multiple V-Belt Drive Assoc., 140 South Dearborn St., Chicago 3, Ill.—14-page pocket-sized booklet entitled, "19 Reasons Why It Is The Dominant Drive of Industry," a primer-like presentation of basic advantages of multiple V-belt drives. Drawings all accompanied by text describing advantages.

Non-Metallics. Continental-Diamond Fibre Co., Newark, Del.—12-page bulletin on Diamond vulcanized fiber, Dilecto, Dilectene, Celeron, Micabond, and Vulcoid. Contains tables of properties, uses, and grades of these materials. Text describes machining properties, and composition of materials. Bulletin No. GF-8.

Petroleum Processes. Universal Oil Products Co., Chicago 4, Ill.—15-page brochure on catalytic cracking, hydrogenation, alkylation, isomerization, thermal cracking, UOP catalysts, hydroforming, dehydrogenation, polymerization, etc. Diagrams illustrate each process in flowsheet form. Continuous text describes processes.

Plates. Filtros, Inc., East Rochester, N. Y.—2 pocket-size booklets on diffuser plates and Filtros plates in general. Contains descriptions of what Filtros is, and how it can be used in aeration, agitation, and diffusion. Covers shapes and sizes, methods of rating plates, installation, etc. Illustrated.

Process Equipment. Read Machinery Co., Inc., York, Pa.—44-page booklet on equipment of all types from acetylators to tanks. Covers mixing, handling, kneading, shredding, metering, blending, weighing and other types of equipment. Each kind is adequately described and illustrated. Good layout and careful printing characterize this booklet.

Pumps. Wilson Chemical Feeders, Inc., 207 Clinton St. (P. O. Box 998), Buffalo, N. Y.—4-page folder on this company's Pulsafeeders, which are chemical proportioning pumps. Lists advantages for manual and automatic, high and low pressure pumping.

Resins and Plastics. Chemical Div. of B. F. Goodrich Co., Rose Bldg., Cleveland 15, Ohio—8-page technical bulletin on "Geon-Hycar Blends." Recites advantages and limitations of Geon resins with Hycar oil resistant synthetic rubber, cites uses for which these blends possess advantages. Discusses compounding techniques. Bulletin No. PM4.

Separators. Eriez Manufacturing Co., Erie, Pa.—4-page folder on Eriez non-electric permanent magnetic separators. Includes illustrations of styles for installation in chutes of wood, light gage steel, and steel. Bulletin No. 102.

Speed Control. Reeves Pulley Co., Columbus, Ind.—4-page large-sized folder informing readers about Reeves variable-speed transmissions, Vari-speed motor pulleys and Vari-speed Motodrives. Nine questions and answers are included, intended to give summary of what can be accomplished with Reeves speed control. Illustrated.

Steam Condensers. C. H. Wheeler Mfg. Co., Lehigh and Sedgley Ave., Philadelphia 32, Pa.—4-page folder on condenser development, matching turbine improvement. Illustrates present condenser types and improvements made since 1916. Bulletin No. 1144.

Steam Traps. Strong, Carlisle & Hammond Co., Cleveland, Ohio—24-page catalog on traps and drainage equipment. Cutaway illustrations show construction of five standard types and various specials. Piping diagrams are shown with data on selection and operation. Materials and parts list, and charts on thermodynamic properties of saturated steam, also included.

Switch. Micro Switch Div. of First Industrial Corp., Freeport, Ill.—100-page ring-bound handbook on over 500 heavy-duty types of Micro switches and auxiliary devices for electrical controls in aircraft, automotive, marine, railway, and heavy machinery. Booklet divided into sections including basic Micro switches, auxiliary actuators, "H" housings, etc. Profusely illustrated with halftones of switch types and diagrammatic drawings of installations and dimension data. Handbook Catalog No. 71.

Synthetic Rubber. Hydrocarbon Chemical & Rubber Co., 335 South Main St., Akron, Ohio—8-page bulletin on Hycar synthetic rubber. Tells what it is, how it can be handled, its physical characteristics, and uses. Includes profuse illustrations and table on comparative properties of vulcanizates of Hycar O.R. and natural rubber.

Tachometers. Jones Motrola Co., Fairfield Ave., Stamford, Conn.—6-page folder on use and operation of tachometers. Discusses Jones tachometers, operation data, design, and history. Types are illustrated. Diagrammatic drawings show construction. Bulletin No. 44-1.

Vacuum Pumps. Beach Russ Co., 50 Church St., New York 7, N. Y.—12-page catalog of this company's rotary piston high-vacuum pumps, telling about their precision build, their speeds, and advantages. Three diagrammatic drawings of pump types included. Two graphs show comparative volumetric efficiencies and high efficiency at low vacuum. Catalog No. 2525.

Vibrating Screens. Denver Equipment Co., 1400 17th St., Denver 17, Colo.—8-page bulletin on the Denver-Dillon Floating Circle vibrating screens. Includes six diagrammatic drawings showing shaft assemblies and installation of various screen types, such as single- and double-deck, floor-mounted and suspension type screens. Bulletin No. S 3-B5.

Water Heaters. Coe Mfg. Co., Painesville, Ohio—4-page folder in four colors, describing this company's safety water heater. Design and operating features included. Safety features include temperature regulator, tempering valve, and safety release valve. Tells how to order heater made to fit.

Water Treatment. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.—24-page bulletin on the Dorrco Hydro-Treater, a self-contained water treatment unit combining flocculation, sludge thickening, and clarification. Includes information on action of unit, types and sizes, fields of application, advantages, capacity ratings, chemical requirements, and sample specifications. Contains charts and sectional drawings. Bulletin No. 9041.

Welding Electrodes. Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.—Booklet containing suggestions on how to select the proper electrode for welding stainless steels, including information on welding procedures and recommendations. Two sections comprise this bulletin the first devoted to discussion of such subjects as carbide precipitation, distortion or warping, effect of heat on base metal; the second giving facts on the several types of electrodes including application recommendations, physical properties and chemical composition of the weld metal.

CHEMICAL ECONOMICS

H. M. BATTERS, Market Editor

TRANSPORTATION DIFFICULTIES HAVE CUT PRODUCTION AND DISTRIBUTION OF CHEMICALS

The chemical industry started the year with production schedules set at higher levels in order to keep pace with the rising requirements created by the stepped-up munitions program. Weather conditions, however, beginning in the latter part of December and continuing almost up to the present, have done much to upset these schedules. Delays in moving raw materials and semi-finished and finished products have had a cumulative effect. In some areas, embargoes were placed on the movement of everything except food and perishable products which added further complications. The over-all effect was to curtail chemical outputs and to slow up activities in industries which are large consumers of chemicals.

Inability to maintain regular deliveries of coal also was an unfavorable factor and for a period in February, steel mills were operating at a rate lower than at any time since 1940. In order to bolster outputs of essential war goods, available cars were allotted to move such materials and where necessary, these materials were transferred from their originally allocated purpose. This meant that many consumers to whom definite amounts of materials had been allotted, found that the allotments had been revoked.

With statistics for all of 1944 now available, domestic production of industrial chemicals appears to have been a little more than 10 percent above that for 1943. The index of the Federal Reserve Board stands at approximately 404 for 1944 and at 366 for 1943. As the Board's index for all production was about the same in the two years, it is apparent that a larger part of chemical output goes into war goods than is the case for total production. These indexes also reveal that chemical plants made their poorest showing in the final quarter of the year but the downward trend was checked in the closing months with indications that the industry might move back to the peak levels reached in the second quarter of 1944. In view of the fact that new plants and several plant expansions are scheduled to come into operation this year, there is the possibility that 1945 will set a new high for chemical production but this will be determined more by the status of requirements than by capacity to produce.

Although heavy domestic demand for chemicals and related products last year was the prime factor in pushing outputs to a new record, foreign trade likewise carried considerable influence. Separate data for our foreign trade in chemicals are being withheld for military reasons but total exports last year ran far ahead of any previously recorded carrying a value of $14,065,000,000 and a volume of about 92,500,000 tons. These figures include Lend-Lease but not the shipments to our armed forces. Of the grand total about 80 percent was represented by Lend-Lease. It is almost certain these record shipments abroad reflect new highs for chemical exports as large quantities were shipped both in normal commerce and on Lend-Lease account.

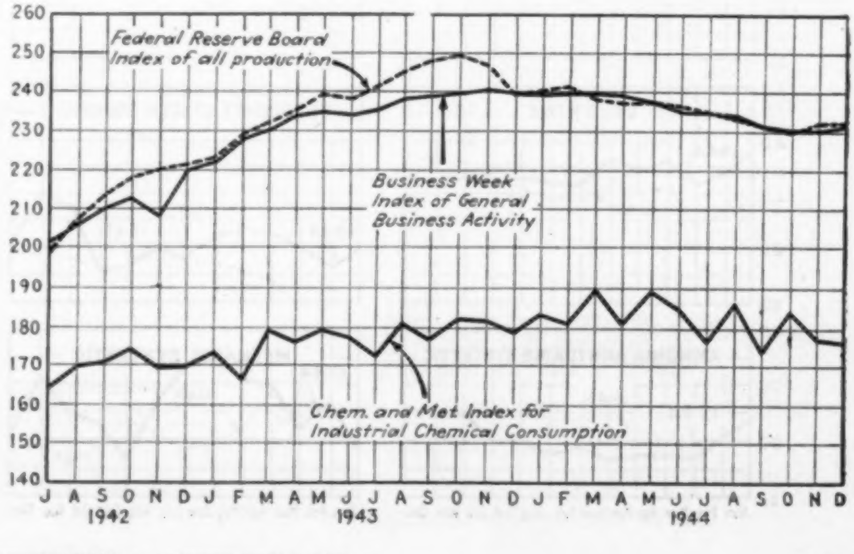
Import figures for 1944 also write that year down as a record. The value of imports was reported at $8,911,000,000 with the volume reaching 59,500,000 tons. Undoubtedly chemicals and chemical raw materials contributed substantially to that total as our own production depended upon receipts of such materials as nitrate of soda, bauxite, chrome ore, and pyrites.

Chem. & Met. Index for Industrial Consumption of Chemicals

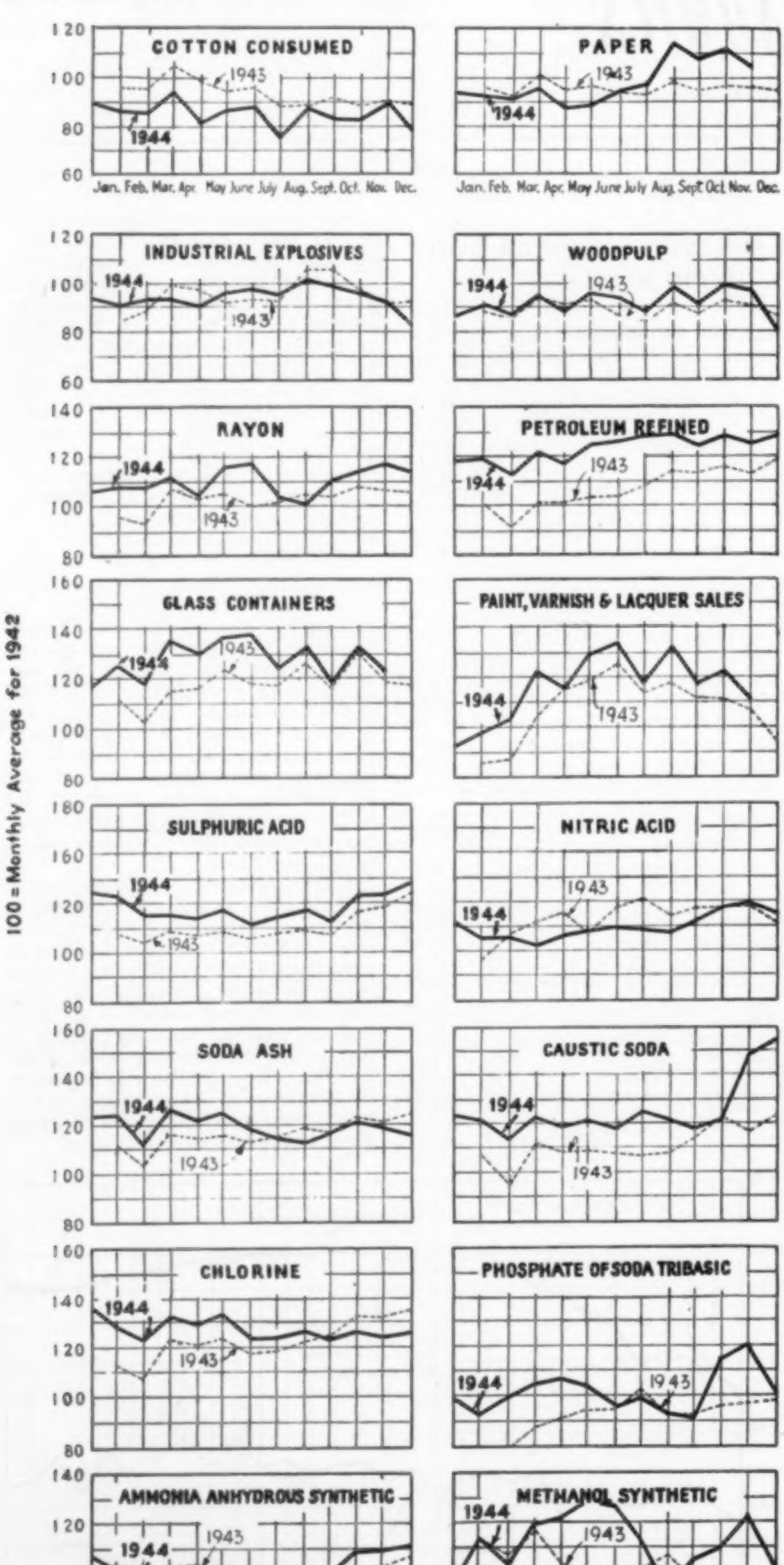
	Nov. revised	Dec.
Fertilizers	38.60	38.31
Pulp and paper	18.14	18.45
Petroleum refining	18.14	18.80
Glass	19.16	19.00
Paint and varnish	15.78	14.39
Iron and steel	12.97	13.35
Rayon	17.74	17.30
Textiles	10.94	10.18
Coal products	10.02	10.06
Leather	4.40	4.25
Industrial explosives	5.29	4.80
Rubber	3.00	3.00
Plastics	5.00	4.90
	179.18	176.59

Some time ago when reconversion planning was on the upgrade, it seemed probable that production of civilian goods would increase with a corresponding growth in the movement of chemicals into industrial lines. The *Chem. & Met.* index for industrial consumption of chemicals has not changed materially in the past year, the net difference indicating a gain of about 3 percent over the 1943 average. The index for December is 176.59 with a revised figure of 179.18 for November. In 1943 the corresponding indexes were 178.45 and 181.15 respectively. While the index represents industrial use of chemicals it is affected by war conditions which may or may not prove offsetting. For instance, consumption of chemicals in the paper trade has been restricted by allocations and by the supply of woodpulp. On the other hand such basic chemicals as soda ash and caustic soda have had the benefit of a wartime boosting of finished products which require large amounts of the alkalis. Because of the packaging burden placed upon glass containers, soda ash had its largest consuming outlet greatly extended and the extensive processing of textiles for military use and the rise in aviation gasoline outputs has called for large consumption of caustic soda.

Another possibility for enlarged capacity for production of chemicals is found in the case of chromate and bichromate of soda. Production has been dropping in recent months with insufficient manpower largely responsible. Demand for these chemicals is urgent and efforts are being made to overcome the labor shortage so that present facilities may work at full capacities. Consideration also is given to the establishment of new facilities in non-critical labor areas with a view of adding about 12,000 tons of new capacity.



PRODUCTION AND CONSUMPTION TRENDS



The chemicals which have been in limited supply were still more difficult to obtain in recent weeks due not only to embargoes, railroad tie-ups, and scarcity of tank cars but also to the diversion of available stocks to fill most urgent requirements to the detriment of civilian lines. Outside of this temporary development nothing has occurred to change the general trend which set in the latter part of last year. That trend calls for emphasis on production of chemicals which are used in the manufacture of munitions and a cut in the amounts allocated to less essential needs where total supplies are not large enough to take care of all requirements.

In the consuming industries, raw material and manpower shortages continue to offer the most serious problems. Textile mills are in the first rank of manufacturing lines which have suffered from the defection of labor. Current output of mills is considerably below that of two years ago but no change for the better is in sight although demand for the finished prodducts would warrant record production with the probability that postwar buying would demand still higher production.

Paper mills are in a position somewhat similar to that reported for textiles with the exception that uncertainty about woodpulp adds to the difficulty. Civilian demands for paper are only partially filled and, given plenty of raw materials and help, producers could greatly expand outputs before they would catch up with the demand. Here, too, the postwar prospects are bright.

Paint manufacturers for a long time have been forced to make use of substitute materials and more recently have found their supply of linseed oil cut to a low level. Following this came the order which severely restricted the amount of lead which might be used for making white lead and slashed the quota of white lead permissible for use in paints. Many of the synthetic resins likewise have been reserved for other distribution. Under these conditions, the outlook for paint is not bright but demand is active and manufacturers will be put to the test of finding new materials which will prove adequate for keeping total paint production up to requirements.

Latest statistics on production within the several branches of the chemical industry show that in the majority of cases there is not much change in the month-to-month totals. The greater recent call for ammonia has served to curtail production of synthetic methanol and this in turn has restricted the formaldehyde output. Alcohol production in January was lower because of the liquor holiday and while stocks are fairly large, there will probably be no let down in alcohol production as long as requirements for butadiene remain as high as they are now. Sulphuric acid outputs are larger due to the operation of new capacities and will be still larger around the middle of the year which should eliminate the tight situation which is current.

Copper for chemical plant purposes...

THIS picture shows copper being rolled by Revere. It comes glistening from between the finishing rolls true to gauge. It is delivered to you in the correct temper and finish as specified, cut to accurate dimensions. We have been rolling copper for 144 years, and being the oldest metal-working firm in the country, know how to do it right.

Copper is a vital war metal, used in many essential chemical plant applications because of its chemical properties, its resistance to corrosion, its ease of fabrication, and its high thermal conductivity. Revere offers copper in plate, sheet and strip, pipe and tube, rod, bar, extruded shapes and other mill forms.

Selection of the proper material for a given use needs careful consideration. Through the Revere Technical Advisory Service we place at your command our extensive knowledge of copper and copper-base alloys. This has proved invaluable to many companies. It is offered to you without obligation. Just write Revere Executive Offices.

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DISTRIBUTORS EVERYWHERE

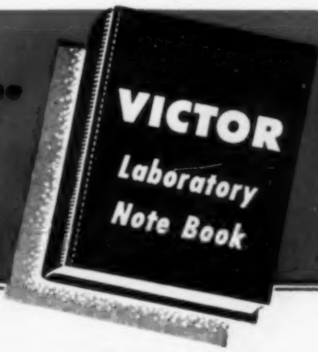
United States Production of Certain Chemicals

November 1944, November 1943 and Eleven-Month Totals for 1944 and 1943

	Units	November 1944	November 1943	Total for First 11 Months 1944	Total for First 11 Months 1943
Acetylene:					
For use in chemical synthesis	M cu. ft.	315,087	309,086	3,565,416	2,437,485
For commercial purposes	M cu. ft.	135,078	149,906	1,420,314	1,588,891
Ammonia, synthetic anhydrous (100% NH_3)	Tons	49,721	46,318	490,246	494,222
Bleaching Powder (35–37% avail. Cl_2)	M lb.	2,680	4,967	45,112	57,154
Calcium acetate (80% $Ca(C_2H_3O_2)_2$)	M lb.	1,190	1,416	10,720	18,722
Calcium arsenate (100% $Ca_3(AsO_4)_2$)	M lb.	2,038	1,518	46,032	64,008
Calcium hypochlorite (70% avail. Cl_2)	M lb.	1,152	985	12,903	10,606
Calcium phosphate (100% $CaH_4(PO_4)_2$)	M lb.	5,949	5,872	55,555	69,390
Chlorine	Tons	101,999	106,420	1,148,429	1,100,336
Chrome green (C. P.)	M lb.	704	665	5,941	7,393
Hydrochloric acid (100% HCl)	M lb.	35,106	29,698	343,926	311,073
Lead oxide (100% Pb_3O_4)	M lb.	9,101	8,192	97,831	92,361
Methanol:					
Natural (80% CH_3OH)	M gal.	361	367	3,842	4,472
Synthetic (100% CH_3OH)	M gal.	6,363	5,210	65,329	59,889
Molybdate orange (C. P.)	M lb.	112	131	1,235	1,624
Nitric acid (100% HNO_3)	Tons	42,571	42,404	430,007	445,273
Phosphoric acid (50% H_3PO_4)	Tons	54,558	52,790	633,522	582,971
Potassium bichromate & chromate (100%)	M lb.	486	697	6,758	8,910
Potassium hydroxide (100% KOH)	Tons	3,567	3,619	40,216	37,270
Soda ash (commercial sodium carbonate):					
Ammonia soda process (98–100% Na_2CO_3)					
Total wet and dry[1]	Tons	374,453	379,015	4,169,910	4,014,957
Finished light[2]	Tons	197,154	207,553	2,258,053	2,094,139
Finished dense	Tons	124,415	110,902	1,337,803	1,269,437
Natural[3]	Tons	14,752	15,337	164,908	149,760
Sodium bicarbonate (100% $NaHCO_3$)	Tons	12,849	15,185	144,500	158,808
Sodium bichromate and chromate (100%)	Tons	6,663	7,450	75,123	75,776
Sodium hydroxide, liquid (100% NaOH):					
Electrolytic process	Tons	99,428	97,566	1,101,331	931,095
Lime-soda process	Tons	59,314	56,871	627,211	607,458
Sodium phosphate:					
Monobasic (100% NaH_2PO_4)	M lb.	2,406	2,062	26,872	19,714
Dibasic (100% Na_2HPO_4)	Tons	5,292	3,744	51,653	41,984
Tribasic (100% Na_3PO_4)	Tons	7,930	6,399	73,707	66,169
Sodium sulphate:					
Anhydrous (refined) (100% Na_2SO_4)	Tons	6,022	5,402	70,006	58,382
Glauber's salt and crude salt cake[3]	Tons	68,109	69,196	732,106	737,065
Sulphuric acid (100% H_2SO_4):[3]					
Chamber process	Tons	279,515	297,215	2,947,139	2,853,522
Contact process[4]	Tons	541,443	493,864	5,468,433	4,943,315
Net contact process[5]	Tons	467,447	423,314	4,828,353	4,427,634
White lead	Tons	5,338	5,150	60,877	60,644

Data for this tabulation have been taken from the "Facts for Industry" series issued by the Bureau of the Census and the WPB Chemicals Bureau. Production figures represent primary production and do not include purchased or transferred material. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. [1] Total wet and dry production including quantities diverted for manufacture of caustic soda and sodium bicarbonate and quantities processed to finished light and finished dense soda ash. [2] Not including quantities converted to finished dense. [3] Collected in cooperation with Bureau of Mines. [4] Includes oleum grades. [5] Excludes spent acid.

RESEARCH REPORT ... from the



New Chemicals Available for Industrial Research

SUBJECT—PHENYLPHOSPHORUS ACID CHLORIDES

SUMMARY OF PROPERTIES

Name	PHENYLPHOSPHORUS DICHLORIDE	PHENYLPHOSPHORUS OXYDICHLORIDE	PHENYLPHOSPHORUS THIODICHLORIDE
Formula	$C_6H_5P\begin{matrix} Cl \\ Cl \end{matrix}$	$C_6H_5P\begin{matrix} Cl \\ =O \\ Cl \end{matrix}$	$C_6H_5P\begin{matrix} Cl \\ =S \\ Cl \end{matrix}$
Physical State	Liquid	Liquid	Liquid
Color	Colorless	Colorless	Colorless
Molecular Weight	179	195	211
Specific Gravity	1.319 (20°C)	1.375 (20°C)	1.376 (13°C)
Refractive Index		1.556 (N_D)	1.622 (N_D)
Acidity	Acid	Acid	Acid
Hydrolysis	Fast	Fast	Very slow
Boiling Point	224.6°C (atm.)	258°C (atm.)	205°C (130 mm)
Melting Point	−55°C	3.0°C	Viscous at −70°C
Solubility	Soluble in common inert org. solvents.	Soluble in common inert org. solvents.	Soluble in common inert org. solvents.
Solubility in Water	Reacts	Reacts	Reacts
Chemical Properties	Fumes in air. Hydrolyzes in water to form phenylphosphinic acid. 2 chlorine atoms reactive with alcohols, phenols, amines, and aldehydes. Adds oxygen, sulfur, and halogens.	Hydrolyzes in water to form phenylphosphonic acid. Two reactive chlorine atoms capable of reacting with alcohols, phenols, and amines to form the corresponding esters and amides.	Decomposes slowly in water. Two reactive chlorine atoms capable of reacting with alcohols, phenols, and amines to form the corresponding neutral esters and amides.
Possible Uses:	Intermediate in preparation of phosphinic acid derivatives and anti-oxidants. Oil-additive.	Intermediate in preparation of plasticizers and oil-additives.	Intermediate for org. synthesis. Extreme pressure lubricant additive. Plasticizer intermediate.

COMMENTS—Phenylphosphorus dichloride is a highly reactive acid chloride from which many derivatives containing trivalent phosphorus can be made. It should be handled with caution.

Phenylphosphorus oxydichloride is a reactive acid chloride which is used as an intermediate in the preparation of the phenylphosphonates. It reacts smoothly with a large number of compounds containing an active hydrogen.

Phenylphosphorus thiodichloride is a less reactive acid chloride which will react directly with phenols to give phenylthiophosphonates.

NOTE—Because of present limitations in the supply of certain critical materials, samples of the above and other Victor Research Chemicals announced from time to time are not always available. Those that are will be sent promptly upon request. Others, for which research has established important uses in essential war production, are already available in commercial quantities.

VICTOR *Chemical Works*

ARMY E NAVY

HEADQUARTERS FOR PHOSPHATES • FORMATES • OXALATES

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NEW YORK, N. Y.; KANSAS CITY, MO.; ST. LOUIS, MO.; NASHVILLE, TENN.; GREENSBORO, N. C.

PLANTS: NASHVILLE, TENNESSEE; MT. PLEASANT, TENNESSEE; CHICAGO HEIGHTS, ILLINOIS

CHEM. & MET.

Weighted Index of Prices for CHEMICALS

Base = 100 for 1937

This month	108.8
Last month	108.8
February, 1944	109.8
February, 1943	108.8

CURRENT PRICES

The accompanying prices refer to round lots. Where it is trade custom to sell f.o.b. works quotations are so designated. Prices are corrected to February 12.

INDUSTRIAL CHEMICALS

Acetone, tanks, lb	$0.07 –	.....
Acid, acetic, 28%, bbl., 100 lb	3.38 –	$3.6
Boric, bbl., ton	109.00 –	113.0
Citric, kegs, lb	.20 –	.2
Formic, cbys, lb	.10½–	.11
Hydrofluoric, 30%, drums, lb	.08 –	.0
Lactic, 44%, tech. light, bbl., lb	.073–	.07
Muriatic, 18°, tanks, 100 lb	1.05 –	.....
Nitric, 36°, carboys, lb	.05 –	.0
Oleum, tanks, wks., ton	18.50 –	20.0
Oxalic, crystals, bbl., lb	.11½–	.12
Phosphoric tech., tanks, lb	.04 –	.....
Sulphuric, 60°, tanks, ton	13.00 –	.....
Tartaric, powd., bbl., lb	.70½–	.....
Alcohol, amyl	.... –	.....
From pentane, tanks, lb	.13½–	.....
Alcohol, butyl, tanks, lb	.10½–	.1
Alcohol, ethyl, denatured, 190 proof	.... –	.....
No. 1 special, tanks, gal., wks.	.50 –	.....
Alum, ammonia, lump, bbl., lb	.04½–	.....
Aluminum, sulphate, com. bags, 100 lb	1.15 –	1.40
Ammonia, anhydrous, cyl., lb	.14½–	.....
tanks, ton	59.00 –	69.0
Ammonium carbonate, powd. tech., casks, lb	.09½–	.12
Sulphate, wks., ton	28.20 –	.....
Amyl acetate, tech., from pentane, tanks, lb	.145–	.....
Aqua ammonia, 26°, drums, lb	.02½–	.0
tanks, ton	65.00 –	.....
Arsenic, white, powd., bbl., lb	.04 –	.0
Barium carbonate, bbl., ton	65.00 –	75.0
Chloride, bbl., ton	75.00 –	78.0
Nitrate, casks, lb	.09½–	.11
Blanc fix, dry, bags, ton	60.00 –	70.0
Bleaching powder, f.o.b., wks., drums, 100 lb	2.50 –	3.0
Borax, gran, bags, ton	45.00 –	.....
Calcium acetate, bags	3.00 –	.....
Arsenate, dr., lb	.07½–	.0
Carbide, drums, ton	50.00 –	.....
Chloride, flake, bags, del., ton	18.50 –	25.0
Carbon bisulphide drums, lb	.05 –	.0
Tetrachloride drums, gal	.73 –	.8
Chlorine, liquid, tanks, wks., 100 lb	1.75 –	2.0
Copperas, bgs., f.o.b., wks., ton	17.00 –	18.0
Copper carbonate, bbl., lb	.19½–	.2
Sulphate, bbl., 100 lb	5.00 –	5.5
Cream of tartar, bbl., lb	.57 –	.....
Diethylene glycol, dr., lb	.14½–	.15
Epsom salt, dom., tech., bbl., 100 lb	1.80 –	2.00
Ethyl acetate, tanks, lb	.11½–	.....
Formaldehyde, 40%, tanks, lb	.03⅔–	.....
Furfural, tanks, lb	.09½–	.....
Glaubers salt, bags, 100 lb	1.05 –	1.10
Glycerine, c.p., drums, extra, lb	.15½–	.16
Lead:		
White, basic carbonate, dry casks, lb	.08½–	.....
Red, dry, sck., lb	.09½–	.....
Lead acetate, white crys., bbl., lb	.12½–	.1
Lead acetate, powd., bag, lb	.11½–	.12
Lithopone, bags, lb	.04½–	.0
Magnesium carb., tech., bags, lb	.06½–	.0
Methanol, 95%, tanks, gal	.58 –	.....
Synthetic, tanks, gal	.24 –	.....
Phosphorus, yellow, cases, lb	.23 –	.2
Potassium bichromate, casks, lb	.09½–	.10
Chlorate, powd., lb	.09½–	.1
Hydroxide (c'stic potash) dr., lb	.07 –	.07
Muriate, 60% bags, unit	.53½–	.....
Nitrate, bbl., lb	.05½–	.0
Permanganate, drums, lb	.19½–	.2
Prussiate, yellow, casks, lb	.16 –	.17
Sal ammoniac, white, casks, lb	.0515–	.0
Salsoda, bbl., 100 lb	1.00 –	1.0
Salt cake, bulk, ton	15.00 –	.....
Soda ash, light, 58%, bags, contract, 100 lb	1.05 –	.....
Dense, bags, 100 lb	1.15 –	.....
Soda, caustic, 76%, solid, drums, 100 lb	2.30 –	3.0
Acetate, del., bbl., lb	.05 –	.0
Bicarbonate, bbl., 100 lb	1.70 –	2.0
Bichromate, casks, lb	.07½–	.0
Bisulphate, bulk, ton	16.00 –	17.0
Bisulphite, bbl., lb	.03 –	.04

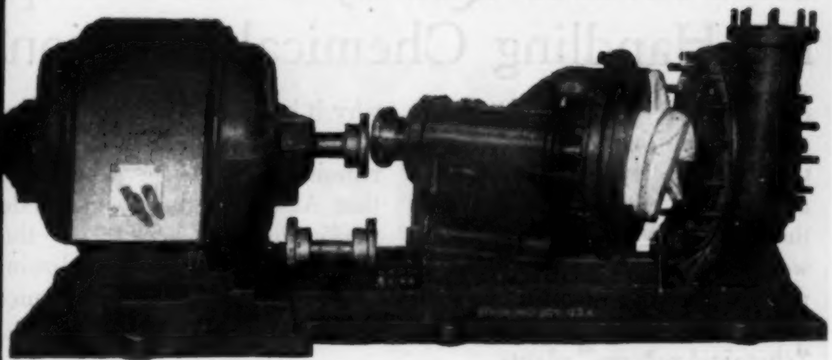
REDUCE YOUR

"Down Time"

by installing this

BYRON JACKSON

PULP PUMP



★ IT IS
HUSKY AND RELIABLE

★ IT HAS
NO TONGUE AND GROOVE
MOUNTINGS

★ AND LINERS
ARE EASILY RENEWABLE

This simple, rugged, easily dismantled pump is proving that the handling of fruit, grain and vegetable pulp, of both high and low consistency, can be accomplished with minimum "down time"—plant throughput can be increased and maintenance costs decreased.

An unusually large suction eye keeps velocities low, and the possibility of vapor binding is minimized.

Complete bracket assembly with rotating element, pump cover and liners, can be removed as an assembled unit without disturbing the driver or the pump suction or discharge piping.

Renewable liners—of hardened iron or steel—securely bolted to the pump case covers—can be easily replaced, thereby eliminating the difficult-to-maintain tongue and groove mounting.

Impeller is of open type, mounted on an extra large heat treated shaft with coarse, self-tightening Acme threads.

Stocks with high acid or alkaline content are handled by special materials suited for the specific job.

Write today for further information.

Close-up of liner as bolted to pump case cover and detail of impeller mounted with self-tightening Acme threads.

ARMY E NAVY

BYRON JACKSON CO.

Houston • LOS ANGELES • New York

CHEM. & MET.

Weighted Index of Prices for

OILS & FATS

Base = 100 for 1937

This month	145.61
Last month	145.56
February, 1944	145.24
February, 1943	143.13

Chlorate, kegs, lb	.06½– .06¾
Cyanide, cases, dom., lb	.14½– .15
Fluoride, bbl., lb	.07 – .08
Hyposulphite, bbl., 100 lb	2.40 – 2.50
Metasilicate, bbl., 100 lb	2.50 – 2.65
Nitrate, bulk, 100 lb	1.35 –.......
Nitrite, casks, lb	.06½– .07
Phosphate, tribasic, bags, lb	2.70 –.......
Prussiate, yel., bags, lb	.09½– .10
Silicate, 40°, dr., wks., 100 lb	.80 – .85
Sulphide, bbl., lb	.02½–.......
Sulphite, crys, bbl., lb	.02½– .02¾
Sulphur, crude at mine, long ton	16.00 –.......
Dioxide, cyl., lb	.07 – .08
Tin crystals, bbl., lb	.39½–.......
Zinc chloride, gran., bbl., lb	.05½– .06
Oxide, lead free, bag, lb	.07½–.......
Oxide, 5% leaded, bags, lb	.07½–.......
Sulphate, bbl., cwt	3.85 – 4.00

OILS AND FATS

Castor oil, No. 3 bbl., lb	$0.13½– $0.14½
Chinawood oil, tanks, lb	.38½–.......
Coconut oil, ceylon, dr. N. Y., lb	.0885–.......
Corn oil crude, tanks (f.o.b. mill), lb	.12¾–.......
Cottonseed oil, crude (f.o.b. mill), tanks, lb	.12¾–.......
Linseed oil, raw, car lots, bbl., lb	.155–.......
Palm, casks, lb	.0865–.......
Peanut oil, crude, tanks (mill), lb	.13 –.......
Rapeseed oil, refined, bbl., lb	nom.
Soybean, tank, lb	.11¾–.......
Menhaden, light pressed, dr., lb	.125–.......
Crude, tanks (f.o.b. factory) lb	.089–.......
Grease, yellow, loose, lb	.08½–.......
Oleo stearine, lb	.09½–.......
Oleo oil, No. 1, lb	.11½–.......
Red oil, distilled, bbl., lb	.12½–.......
Tallow extra, loose, lb	.08½–.......

COAL-TAR PRODUCTS

Alpha-naphthol, crude, bbl., lb	$0.52 – $0.55
Alpha-naphthylamine, bbl., lb	.32 – .34
Aniline oil, drums, extra, lb	.15 – .16
Aniline, salts, bbl., lb	.22 – .24
Benzaldehyde, U. S. P., dr., lb	.85 – .95
Benzidine base, bbl., lb	.70 – .75
Benzoic acid, U. S. P., kegs, lb	.54 – .56
Benzol, 90%, tanks, works, gal	.15 –.......
Benzyl chloride, tech., dr., lb	.23 – .25
Beta-naphthol, tech., drums, lb	.23 – .24
Cresol, U. S. P., dr., lb	.11 –.......
Cresylic acid, dr., wks., gal	.81 – .83
Diphenyl, bbl., lb	.15 –.......
Diethylaniline dr., lb	.40 – .45
Dinitrotoluol, bbl., lb	.18 – .19
Dinitrophenol, bbl., lb	.22 – .23
Dip oil, 15%, dr., gal	.23 – .25
Diphenylamine, dr. f.o.b. wks., lb	.60 –.......
H, acid, bbl., lb	.45 – .50
Hydroquinone, bbl., lb	.90 –.......
Naphthalene, flake, bbl., lb	.07 – .07½
Nitrobenzene, dr., lb	.08 – .09
Paracresol, bbl., lb	.41 –.......
Para-nitraniline, bbl., lb	.47 – .49
Phenol, U. S. A., drums, lb	.10½– .11
Picric acid, bbl., lb	.35 – .40
Pyridine, dr., gal	1.70 – 1.80
Resorcinol, tech., kegs, lb	.75 – .80
Salicylic acid, tech., bbl., lb	.26 – .33
Solvent naphtha, w.w., tanks, gal	.27 –.......
Tolidone, bbl., lb	.86 – .88
Toluol, drums, works, gal	.33 –.......
Xylol, com., tanks, gal	.20 –.......

MISCELLANEOUS

Casein, tech., bbl., lb	$0.18 – $0.24
Dry colors	
Carbon gas, black (wks.), lb	.0335– .30
Prussian blue, bbl., lb	.36 – .37
Ultramarine blue, bbl., lb	.11 – .26
Chrome green, bbl., lb	.21½– .30
Carmine, red, tins, lb	4.60 – 4.75
Para toner, lb	.75 – .80
Vermilion, English, bbl., lb	2.50 – 2.55
Chrome, yellow, C. P., bbl., lb	.14½– .15½
Gum copal, congo, bags, lb	.09 – .30
Manila, bags, lb	.09 – .15
Damar, Batavia, cases, lb	.10 – .22
Kauri, cases, lb	.18 – .60
Magnesite, calc., ton	64.00 –.......
Pumice stone, lump, bbl., lb	.05 – .07
Rosin, H., 100 lb	6.71 –.......
Shellac, orange, fine, bags, lb	.39 –.......
Bleached, bonedry, bags, lb	.39 –.......
T. N. bags, lb	.31 –.......
Turpentine, gal	.89½–.......

NEW CONSTRUCTION

PROPOSED WORK

Ill., East St. Louis—General Chemical Co., East St. Louis, plans to construct and complete plant here. Estimated cost $500,000.

Ill., Monsanto—Monsanto Chemical Co., 1700 South Second St., St. Louis, Mo., plans to construct a new sulphuric acid plant here to have a yearly capacity of 72,000 tons. Estimated cost $700,000.

Ind., East Chicago—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., plans to construct additions to its sulphuric acid plant here. Project will be financed by Defense Plant Corp., Washington, D. C. Estimated cost $400,000.

Ind., Hammond—Stauffer Chemical Co., Hammond, plans to increase the capacity of its sulphuric acid plant. Project will be financed by Defense Plant Corp., Washington, D. C. Estimated cost $200,000.

Ind., Muncie—Ball Bros. Glass Co., Macedonia Ave. at 9th St., plans to rebuild portion of its plant recently destroyed by fire. Estimated cost $100,000.

Mich., Detroit—American Smelting & Refining Co., Federated Metals Div., 11630 Russell St., is having plans prepared for an addition to its plant for a chlorine rack house and dross room. Cost $70,000.

Mich., Detroit—U. S. Rubber Co., 6600 East Jefferson Ave., is having plans prepared by Lockwood Greene Engineers, Inc., 10 Rockefeller Plaza, New York 20, N. Y., for an addition to its plant here. Estimated cost $3,000,000.

N. J., Cranford—Johnson & Johnson, 500 George St., New Brunswick, N. J., are having plans prepared by Ballinger & Son, Archts.-Engrs., 105 South 12th St., Philadelphia, Pa., for a 1 story manufacturing plant here. Estimated cost $250,000.

N. J., Paulsboro—Socony Vacuum Oil Co., 26 Bway., New York, N. Y., plans to construct a research laboratory here. Estimated cost $250,000.

N. Y., Deferiet—St. Regis Paper Co., 230 Park Ave., New York 17, N. Y., is having plans prepared by Charles T. Main, Inc., 201 Devonshire St., Boston, Mass., for an addition to its paper and pulp mill here. Estimated cost $3,000,000.

O., Newark—Pharis Tire & Rubber Co., Newark, is having plans prepared by Osborn Engineering Co., Engr., 7016 Euclid Ave., Cleveland, for a 3 story, 50x150 ft. mill building and boiler house. Estimated cost $615,000.

Pa., Bridgeville—American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20, N. Y., plans to alter and construct additions to its factory here. Estimated cost $63,800 .

Pa., Jeannette—Pennsylvania Rubber Co., Chambers Ave., is having plans prepared by Fletcher Thompson, Inc., Archt., 211 State St., Bridgeport, Conn., for a 1 story 175x200 ft. factory building.

	Current Projects		Cumulative 1945	
	Proposed Work	Contracts	Proposed Work	Contracts
New England..............	....	$40,000	....	$125,000
Middle Atlantic............	$3,854,000	1,280,000	$3,854,000	1,635,000
South......................	40,000	200,000	40,000	200,000
Middle West...............	5,585,000	40,000	5,585,000	80,000
West of Mississippi.........	24,450,000	....	24,450,000	11,325,000
Far West..................	875,000	3,000,000	875,000	3,105,000
Canada....................	665,000	600,000	1,015,000	600,000
Total..................	$35,469,000	$5,160,000	$35,819,000	$17,130,000

Pa., Philadelphia—Abrasive Co., Tacony and Fraley Sts., plans to construct alterations to its plant. Estimated cost $250,000.

Texas—Defense Plant Corp., Wash., D. C., plans the construction of a carbon black plant in the Pampa area. Estimated cost $1,500,000.

Tex., Sunray—Defense Plant Corp., Wash., D. C., plans the construction of a carbon black plant in this area, to be operated by Continental Carbon Co., 295 Madison Ave., New York, N. Y. Estimated construction cost $1,200,000.

Tex., Waco—Defense Plant Corp., Wash., D. C., plans to double the capacity of the rubber tire manufacturing plant here operated by the General Tire & Rubber Co., Akron, O. Estimated cost $1,750,000.

Tex., Port Arthur—Jefferson Chemical Co., c/o American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20, N. Y., and Texas Co., Port Arthur, plans to construct chemical plant to convert waste oils into chemicals. Estimated cost $20,000,000.

Va., Radford—U. S. Engineer, Wash., D. C., plans to construct an addition to ordnance plant here.

Wash., Bellingham—Pacific Coast Paper Mills, Army and Chestnut Sts., plans to construct a 2 story, 95x145 ft. factory building, a 2 story, 100x240 ft. machinery building and small sheet iron building to house boiler equipment. Estimated cost $875,000.

B. C., Vancouver—Chief Brand Oils, Ltd., 751 Greenville St., plans to construct a plant. Estimated cost $40,000.

Ont., Bedford—Ontario Phosphate Industries, Ltd., Bedford, plans development of phosphate deposits here. Estimated cost $75,000.

Ont., Kitchener—Dominion Rubber Co., Ltd., 145 Strange St., Kitchener, plans to construct a 137x187 ft. addition to its plant. Margison & Babcock, 137 Wellington St., W., Toronto, Archt. Estimated cost $300,000.

Ont., Toronto—Canadian Tire Corp., 837 Yonge St., is having plans prepared for a 5 story addition to its warehouse. J. A. Thatcher, 37 Cowan Ave., Archt. Estimated cost $200,000.

Ont., Toronto—Noxzema Chemical Co. of Canada, Ltd., c/o J. Marvin Shaw, 92 Jarvis St., contemplates the construction of a new addition to its plant. Estimated construction cost $50,000.

CONTRACTS AWARDED

Calif., Wilmingon—Union Oil Co. of California, 627 West 7th St., Los Angeles, has awarded the contract for the construction of a group of 'administrative buildings, including storage, shops, warehouse, storage rack and machine shop buildings, etc., at refinery here to McNeil Construction Co., 5860 Avalon Blvd., Los Angeles. Est. $3,000,000.

Conn., New Haven—New Haven Pulp & Board Co., 259 East St., has awarded the contract for alterations and additions to its factory to Dwight Building Co., 152 Temple St., New Haven. Estimated cost $40,000.

Md., Curtis Bay—Brooklyne Chemical Works, 9th and Patapsco Ave., has awarded the contract for 1 story T-shaped, 40x170 ft. and 50x70 ft. building at chemical plant to Baltimore Contractors, 711 South Central Ave., Baltimore. Estimated cost $40,000.

N. J., Newark—Rubberset Co., 56 Ferry St., has awarded the contract for the construction of a 1 story, 50x100 ft. storage building to Vitale Bros. Co., 123 Columbia Ave. Estimated cost $40,000.

N. J., Piscataway (Bound Brook P. O.)—Bennel Products Co., Meadow Rd., has awarded the contract for a 1 story boiler house and coal silo to C. J. Schubert, 93 Arsdale Terrace, East Orange. Estimated cost $100,000.

Pa., Meadville—David Meade Distilling Co., Race St., has awarded the contract for alterations and additions to its alcohol producing plant to J. M. Baldwin, Whitfield Bldg., Pittsburgh. Estimated cost $100,000.

Pa., Neville Island—Pittsburgh Coke & Chemical Co., Grant Bldg., Pittsburgh, has awarded the contract for the construction of six buildings at its chemical plant to Lummus Co., 420 Lexington Ave., New York, N. Y. Estimated cost $1,000,000.

Tenn., Clarksville—B. F. Goodrich Co., 500 South Main St., Akron, O., has awarded the contract for an addition to its plant here to Hughes-Foulkrod Co., Schaff Bldg., Philadelphia, Pa. Estimated cost $200,000.

Wis., Appleton—Institute of Paper Chemistry, 1101 East South River St., has awarded the contract for a 1 story, 40x1160 ft. factory to Ben B. Gauther Co., 78 State St., Oshkosh.

Ont., Hamilton—Firestone Tire & Rubber Co. of Canada, Ltd., Beach Rd., has awarded the contract for an addition to its plant to Frid Construction Co., Ltd., 126 King St. E., Hamilton. Estimated cost including equipment $600,000.